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THE
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FACIAL EXPRESSION IN ADVERTISEMENTS

By Harold E. Burtt and J. Camden Clark
Ohio State University

INTRODUCTION

The facial expression portrayed in an advertising cut is frequently an important factor in the sale. Efforts to portray "satisfaction" are quite common, and it is to this feeling that the present study is confined.

Experiments upon the effectiveness of various types of advertising appeals have shown that this effectiveness varies with different commodities. This suggests that a similar relation may hold in the use of facial expression and that perhaps a satisfied expression in a cut may have quite different value in advertising different varieties of goods. It would seem, a priori, that certain purchases are serious and that pronounced satisfaction in the facial expression would be misplaced, while with other objects whose use normally provokes considerable satisfaction, such an expression would be desirable. It is probable that the advertiser sometimes errs in the use of such facial expressions. One notes, for instance, cuts of a man laughing moderately at a game of solitaire or smoking a choice cigar with marked solemnity. Perhaps this is correct or perhaps it is irrelevant but at least it suggests a problem.

The following study is devoted mainly to the problem of whether the optimal degree of satisfaction portrayed in the facial expression of an advertisement varies with the commodity advertised. A subsidiary problem is whether the apparent satisfaction in the facial expression of a photograph corresponds to the actual satisfaction felt by the subject who posed for it, i. e., whether the picture actually conveys the feelings intended.

It is impossible to approach such problems by strictly objective methods. The only possibility is to obtain observers' judgments as to how they would react to certain pictures with reference to the purchase of various commodities. Judgments of this sort are perhaps difficult and none too reliable but, with a sufficient number of observers and proper control of material and conditions, are undoubtedly more valuable than a priori generalization.

MATERIAL.

Two sets of material were used in the experiment. The first consisted of a series of bust photographs of the same male subject showing different facial expressions. Considerable preliminary work was necessary in securing a subject who could pose properly. The set finally used consisted of six photographs that were taken in succession, with the subject in the same position. The lighting, exposure and other technical aspects were constant. The subject posed in succession six increasing degrees of satisfaction starting with slight and ending with rather extreme. He was confident of the climactic effect and corroborated this by ranking the pictures subsequently.

A set of these photographs was enlarged to 7x9 inches and each one mounted without margin under celluloid for daylight display. Contact prints 4x5 inches were mounted individually on white cardboard of suitable size for projection in a Balopticon.

The other material consisted of 23 cuts of men's faces taken from current advertisements and portraying various degrees of apparent satisfaction. It was thought best to limit the faces to those of one sex thus avoiding an additional variable. The advertisements were trimmed so that none of the copy remained, and so that nothing in the cut suggested the kind of commodity advertised. It was impossible to control size but all the cuts were sufficiently large and sufficiently well printed to be seen without difficulty when projected on the screen. Preliminary experiments served as a basis for selecting this final set of cuts from a somewhat larger number. The cuts were centered on white cardboard of suitable size for projection.

For presenting the enlarged photographs a display board was used. This consisted merely of a medium gray cardboard about 2x3 feet mounted on a light framework with the longest dimension horizontal. There was a narrow gray rack at the bottom of the card and the top was tilted slightly away from the observer so that the photograph could rest against the background. For the small photographs and the cuts a Balopticon was used to project them upon a screen. A metal plate actuated by a spring held the card on which the picture was mounted in position and to change material it was necessary merely to depress the plate and insert another card.

METHOD.

Series I employed the enlarged photographs and the display board. The experiments were made in daylight with one observer at a time and all the results recorded by the experimenter. This series comprised three parts, which were given in succession.

In *Series IA* the photographs were presented one at a time in

random order (different for each subject) with the instructions, "Describe fully the feelings which this picture suggests to you." The complete introspection was recorded and subsequently analyzed.

In *Series IB* the observer was given the six photographs in a pile arranged in random order and was told: "These pictures were taken when the subject felt different degrees of satisfaction. Arrange them in order with the one showing the most satisfaction on this end and the one showing the least satisfaction on this end." The observer's ranking was recorded in terms of the key letters on the backs of the photographs.

In *Series IC* the photographs were again shown singly in random order with the instructions: "Name five commodities for which you think this picture would be effective in an advertisement. For which of these five would it be most effective, next most effective, etc.?" The five commodities mentioned were recorded in order for each photograph.

Series II practically repeated series I using the group method of experimentation. The treatment of results was identical. The smaller photographs were projected on the screen. The room was, of course, dark but could be illuminated sufficiently for writing by merely opening a door in the side of the Balopticon. The pictures were each given a key letter and presented in the same order in all three parts of the series. This order began and ended with moderate degrees of satisfaction and no two adjacent degrees occurred in succession.

In *Series IIA* and *Series IIC* the instructions were identical with those of *IA* and *IC*. A picture was presented and its code letter given (verbally). After thirty seconds of darkness the room was illuminated for thirty seconds during which time the observers recorded their introspection on a blank. Another similar alternation of darkness and illumination followed for the benefit of those who had not finished or who wished to note further aspects. A third alternation was given if requested by any observer.

Series IIB involved ranking the photographs. Previous to the experiment the following six degrees of satisfaction had been written on the blackboard, but the observers' attention not called to them until the proper time.

1. Extremely satisfying.
2. Very satisfying.
3. Quite satisfying.
4. Fairly satisfying.
5. Slightly satisfying.
6. Very slightly satisfying.

The instructions were as follows: "These pictures were taken

when the subject felt different degrees of satisfaction. These degrees are as follows, (experimenter points to the list on board). You are to write down the six letters and the six numbers with the proper letter. I will show the pictures in succession several times so that you can decide carefully." The photographs were then shown repeatedly in the same order and the code letter stated for each as it was shown. Each presentation was of fifteen seconds duration followed by a few seconds illumination.

Series III employed the six small photographs and the twenty-three cuts in a group experiment. In the discussion of results the former will be designated *IIIA* and the latter *IIIB*. They were given, however, at one sitting with the photographs in a random order followed by the cuts in a random order. These series were concerned only with the problem of commodities and the judgments were controlled rather than spontaneous. It had been found that practically all the commodities mentioned spontaneously in *series IC* and *IIC* could be summarized under ten classes (cf. infra, table II). Accordingly, a mimeographed blank was provided with ruled columns headed with the names of these classes. Successive rows were likewise ruled and numbered at the left from 1 to 29. The blanks were distributed and the following instructions given. "This is an experiment upon facial expressions in relation to advertising. I am going to show you a series of pictures and in each case you are to judge for what classes of commodities the picture would be effective in an advertisement. By effective is meant whether it would induce persons to buy the commodity in question. Confine your answers to the classes listed on the blank. After the number of the picture put a 1 in the column to indicate the commodity for which it would be most effective and 2 in the column to indicate second choice. You may mark other choices if you wish but always give at least two."

A picture was presented and its number given. After fifteen seconds the room was illuminated for fifteen seconds, (an assistant operating the wall switch) for the observers to record their judgments. Another alternation of picture and illumination followed. The experimenter then queried, "All right?" and if there was no request for further repetition proceeded to the next picture. There was no break between *series IIIA* and *IIIB*.

The ranking of satisfaction portrayed in the photographs was obtained from the subject who posed. As this was impossible with the cuts, fifteen observers who did not participate in *series III*, ranked them. These observers were individually given the twenty-three cards and told to arrange them with the one showing the most satisfaction on the top of the pile and the one showing the least on the bottom and the intervening ones in order. The pile was returned to the experimenter who recorded the order. Then

the fifteen ranks given each picture were averaged. There was some disagreement among the judges in their rankings of the various cuts. The mean variation of the fifteen ranks assigned to each picture was computed. The smallest of these mean variations is 1.6, the largest 6.7, and the average 4.2. If two pictures in this series had each this mean variation of 4.2, the probable error of difference would be 1.3. So it would seem that a given picture was located at least within a few places of its correct position.

The subjects were students—mostly undergraduates—in psychology classes at Ohio State University. *Series I* had 9 subjects, *series II*, 16, and *series III*, 67. The group experiments were conducted by the senior writer, (Burtt).[1]

RESULTS.

The minor problem above mentioned will be discussed first, viz., the correspondence of satisfaction actually felt with that apparent in the facial expression. *Series IB* and *IIB* give the most direct answer to this problem. For convenience in subsequent discussion the six photographs will be denoted by the letters U, V, W, X, Y, and Z, with U the one in which the subject who posed felt the least satisfaction, V the next degree and so on up to Z the greatest satisfaction. The extent to which the observers' rankings of the six photographs correspond to this order of satisfaction felt by the subject is shown in Table I.

TABLE I.

AVERAGE RANKS.

Series	U	V	W	X	Y	Z
IB	5.8	4.7	4.4	2.6	2.2	1.2
IIB	5.9	4.9	4.0	2.4	2.4	1.3
Both	5.8	4.8	4.2	2.5	2.3	1.3

The original ranks were tabluated with the six made by a given observer in a row. Then the columns were averaged to obtain the average rank assigned each photograph. These averages appear in table I, for *series IB, IIB* and both together.

It is obvious that the observers judged quite accurately the satisfaction felt by the subject of the photographs. Considering the averages of both series the correlation is perfect. Moreover, the more detailed results show that all but three of the twenty-five subjects ranked U lowest and all but two ranked Z highest. The spontaneous descriptions of feelings suggested by the photographs indicate a rather climactic order from U to Z.

This suggests Langfeld's[2] finding,—covering a wide range of emotions and attitudes but not the one specifically studied in the present case,—of "uniformly good and consistent" judgments of emotions from facial expression.

[1]The writers are indebted for some suggestions during the earlier stages of the work to Dr. Harry W. Crane.

[2]Langfeld, H. S.: *The Judgment of Emotions from Facial Expression.* Journal of Abnorm. Psych. 1918, 13, 172.

The main problem of the experiment was the effectiveness of various degrees of apparent satisfaction for advertising various commodities. The results will be considered in terms of the 10 classes of commodities under which practically all the spontaneous judgments fell. The results for *series IC* and *IIC* were combined, as both used spontaneous reports on the same six photographs. A preliminary tabulation was made to show the number of times each commodity was mentioned in connection with each picture. Separate tables were made for first choices, second choices, etc., and total choices. *Series IIIA* which involved the same material with controlled judgments was tabulated in the same way. In *series IIIB* it did not seem worth while to evaluate each picture separately especially in view of the rather considerable disagreement among the fifteen observers whose judgments provided the original rankings for satisfaction. To facilitate comparison with the other series of six photographs the cuts were arbitrarily combined into six groups on the basis of the average satisfaction rankings. Each group comprised 4 cuts with the exception of the lowest satisfaction group which comprised 3 cuts. The division was made in this way to avoid drawing the line between cuts with the same average rank. A preliminary tabulation was made to show the number of times each commodity was mentioned in connection with each of these six groups of cuts. Separate tables were made for first choices, second choices and total choices.

The results could now be considered from two standpoints. On the one hand it was possible to determine for each commodity what proportion of the mentions were accorded to each picture or group of pictures, i. e., what degree of satisfaction was most frequently selected as appropriate for a given commodity. On the other hand, it was possible to note for each picture or group of pictures what proportion of the mentions were accorded to each commodity, i. e., what commodities were most frequently selected as ones for which a given degree of satisfaction would be appropriate.

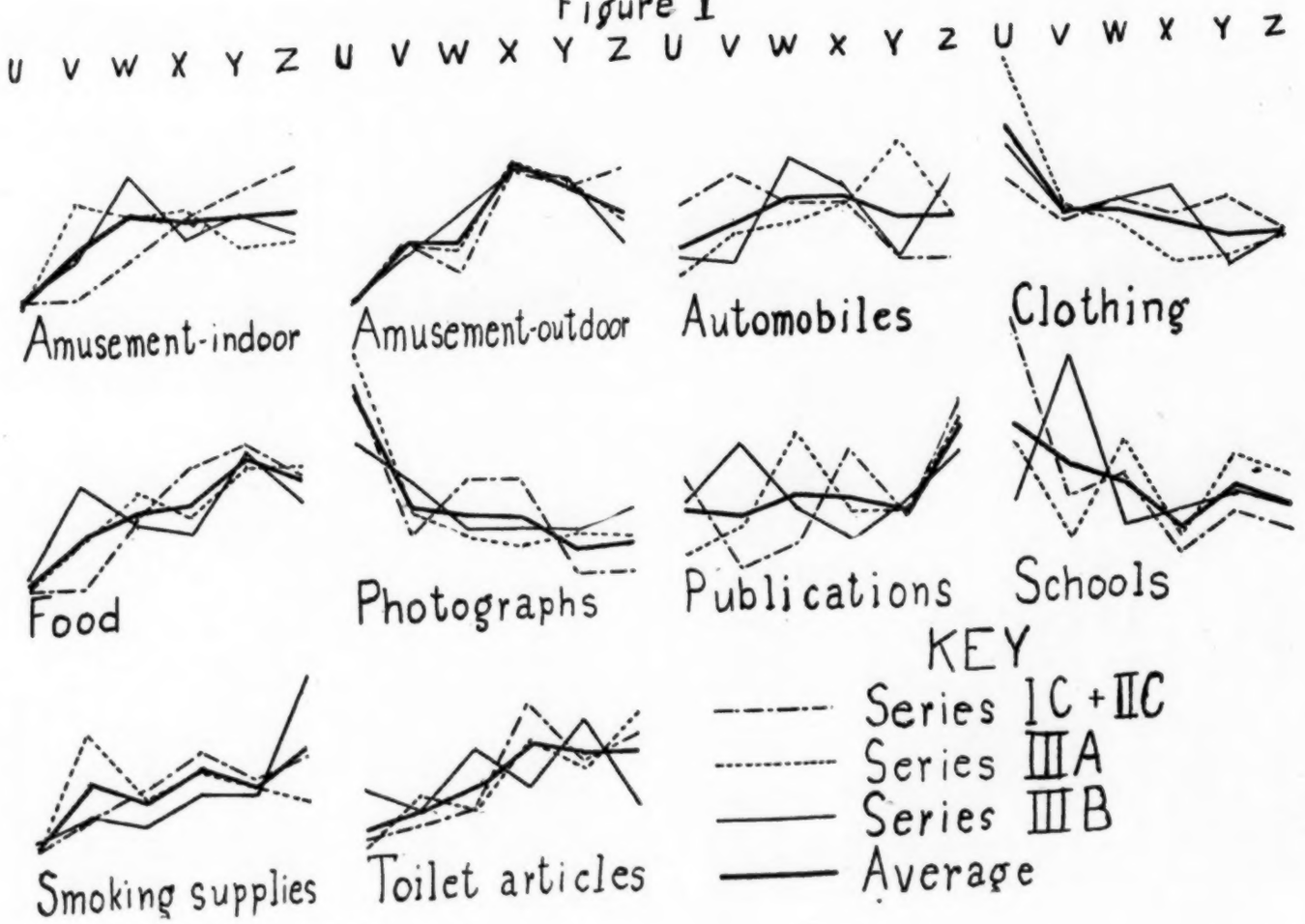
Table II presents the results from the former of the above standpoints.

TABLE II.

PERCENTAGE DISTRIBUTION OF TOTAL CHOICES FOR EACH COMMODITY.

Commodity	Series	n	U	V	W	X	Y	Z
Amusements—indoor	IC+IIC	33	3	3	12	21	27	33
	III A	87	1	25	22	23	14	15
	III B	287	3	12	31	16	22	17
	Av.		2	13	22	20	21	22
Amusements—outdoor	IC+IIC	14	0	14	7	29	21	29
	III A	98	0	13	12	32	26	17
	III B	313	1	11	19	30	27	12
	Av.		0	13	13	30	25	19
Automobiles	IC+IIC	15	20	27	20	20	7	7
	III A	55	4	13	15	20	33	16
	III B	276	8	7	29	23	7	26
	Av.		11	16	21	21	16	16
Clothing	IC+IIC	94	24	14	18	15	18	11
	III A	106	51	18	13	4	5	9
	III B	425	32	16	18	21	3	10
	Av.		36	16	16	13	9	10
Food	IC+IIC	37	0	0	16	27	32	24
	III A	70	0	11	21	16	26	26
	III B	253	3	23	14	12	29	18
	Av.		1	11	17	18	29	23
Photographs	IC+IIC	18	44	11	22	22	0	0
	III A	127	51	15	9	7	9	8
	III B	205	31	22	11	11	10	14
	Av.		42	16	14	13	6	7
Publications	IC+IIC	19	21	0	5	26	11	37
	III A	33	3	9	30	12	12	33
	III B	254	15	28	13	6	13	25
	Av.		13	12	16	15	12	32
Schools	IC+IIC	22	55	14	18	0	9	5
	III A	23	26	4	26	4	22	17
	III B	230	13	46	7	10	13	10
	Av.		31	21	17	5	15	11
Smoking supplies	IC+IIC	48	4	12	17	25	19	23
	III A	84	4	30	15	21	17	13
	III B	312	6	12	9	16	15	42
	Av.		5	18	14	21	17	26
Toilet articles	IC+IIC	92	4	7	11	33	20	26
	III A	67	2	13	10	25	18	31
	III B	352	15	10	23	14	29	9
	Av.		7	10	15	24	22	22

Figure 1


U V W X Y Z U V W X Y Z U V W X Y Z U V W X Y Z
Amusement-indoor
Amusement-outdoor
Automobiles
Clothing
Food
Photographs
Publications
Schools
Smoking supplies
Toilet articles
KEY
Series 1C + IIC
Series IIIA
Series IIIB
Average

The original figures were reduced to per cents to make the various series comparable. Only "total choices" are considered. First choices were tabulated separately but did not differ substantially from total choices and the latter were then selected because they involved a larger number of cases. The first column gives the classes of commodities, the second the series and the third the number of choices or mentions involved. The following six figures in a given row indicate the per cent of mentions for each of the six pictures or group of pictures. The headings U, V, W, etc., indicate increasing degrees of apparent satisfaction from U to Z; for *series IC, IIC* and *IIIA* they denote the six photographs, and for *IIIB* they denote groups of four cuts except that U involves only three cuts. For example, of the thirty-three times indoor amusements were mentioned in *series IC* and *IIC*, three per cent of these mentions were for photograph U, three per cent for V, twelve per cent for W, etc; while of the 287 mentions of indoor amusements in *series IIIB*, three per cent were for U, twelve per cent for V, thirty-one per cent for W, etc. Moreover, the average of the three series as far as indoor amusements are concerned gives two per cent for U, thirteen per cent for V, etc.

These same results are shown graphically in Figure 1.

The ten sets of curves correspond to the ten blocks in Table II. In each set the different lines denote the three series and the average of the three as shown in the key. The abscissae of the curves denote from left to right the six classes U, V, W, X, Y, Z, while the ordinates represent per cents. The total of the ordinates of each curve is, of course, 100 per cent. It should be noted in the figure and the table that the value for U in *series IIIB* should be perhaps a trifle larger as it involves three pictures instead of four.

The results are considered from the other aforementioned standpoint in Table III.

TABLE III.

PERCENTAGE DISTRIBUTION OF TOTAL CHOICES FOR EACH PICTURE.

Picture	Series	Amusements indoor	Amusements outdoor	Automobiles	Clothing	Food	Photographs	Publications	Schools	Smoking supplies	Toilet articles
U	IC+IIC	2	0	5	40	0	14	7	21	4	7
	III A	1	0	1	41	0	49	1	4	2	1
	III B	2	1	6	35	2	17	10	8	5	14
	Av.	2	0	4	39	1	27	6	11	4	7
V	IC+IIC	3	5	11	35	0	5	0	8	16	16
	III A	17	10	6	15	6	15	2	1	20	7
	III B	7	7	4	14	11	9	14	21	7	7
	Av.	9	7	7	21	6	10	5	10	14	10
W	IC+IIC	7	2	5	29	10	7	2	7	14	17
	III A	16	10	7	12	13	10	9	5	11	6
	III B	17	11	15	15	7	4	6	3	5	16
	Av.	13	8	9	19	10	7	6	5	10	13
X	IC+IIC	8	5	3	16	11	5	6	0	13	34
	III A	16	25	9	3	9	7	3	1	14	13
	III B	10	19	13	18	6	5	3	5	11	10
	Av.	11	16	8	12	9	6	4	2	13	19
Y	IC+IIC	12	4	1	23	16	0	3	3	12	25
	III A	10	20	14	4	14	10	3	4	11	10
	III B	13	17	4	3	15	4	7	6	10	21
	Av.	12	14	6	10	15	5	4	4	11	19
Z	IC+IIC	14	5	1	13	12	0	9	1	14	31
	III A	10	14	7	8	15	8	9	3	9	17
	III B	9	7	14	8	9	5	12	4	25	6
	Av.	11	9	7	10	12	4	10	3	16	18

The first column gives the picture or group of pictures and the next the series. The following columns in any row indicate the per cent of mentions for each of the ten commodities. For instance, with picture U in *series IC* and *IIC*, 2 per cent of the observers selected indoor amusements as a commodity for which U would be suitable, 5 per cent selected automobiles, 40 per cent clothing, etc.

Series IC and *IIC* involved about fifty total mentions, *series IIIA* about 130 and *IIIB* about 500, for each photograph or cut. Figure 1 and Table III show fairly consistent results with certain commodities but not with others.

The curves for indoor amusements agree in starting low and they approach each other closely again at X. In Table III this commodity is seldom mentioned for U but more frequently thereafter. Apparently slight satisfaction is undesirable while it is not clear whether moderate or greater degrees are most desirable.

With outdoor amusements the case is clear. The curves show marked agreement with a minimum at U and a maximum at X. In the table for X, outdoor amusements stand next to the highest in average mentions. Evidently a rather marked but not extreme degree of satisfaction is the most desirable.

It is impossible to draw any conclusion regarding automobiles because there is little agreement among the curves and the average curve is nearly level.

The curves for clothing all start high and descend first abruptly and then gradually, while in the table, picture U has a large proportion of mentions as suitable for clothing. Evidently, the slightest degrees of satisfaction used in the experiment were the most suitable for this commodity.

Food shows a fair agreement in the curves, with a gradual rise toward the higher degrees of satisfaction. This relation is not as clearly manifest in the table, but on the whole it seems that a fairly high degree of satisfaction should be effective in food advertisements.

The curves for photographs are rather similar to those for clothing and the tabular results also are similar. Apparently, the slight degrees of satisfaction should be most effective.

The curves for publications are equivocal with a suggestion of a uniform rise at the end. This fact is not clearly borne out by the table.

There is considerable discrepancy at the left in the curves for schools although the average trend is downward. The table is inconclusive. If there is any suggestion it is toward the effectiveness of the lesser degrees of satisfaction.

Smoking supplies show a fairly consistent and gradual rise in

the curves. The table indicates frequent mention of this commodity, for all the pictures except U. It would seem that any but the slight degrees of satisfaction would be desirable and perhaps there would be a slight gain in effectiveness as the satisfaction was increased.

Toilet articles have a fairly consistent rise through the lesser degrees of satisfaction with little average change thereafter. In the table toilet articles are frequently mentioned for all pictures except the first. It seems that an average or greater degree of satisfaction should be effective in advertising such articles.

The above results depend of course upon the judgments of an untrained, unselected group of students. They may have judged in some instances by factors other than the one studied. Recognition of a picture, for instance, might sometimes affect the results. the conclusion that for clothing and photographs, advertisements showing rather slight amounts of satisfaction should be more effective than those showing greater amounts, while for outdoor amusements, food, smoking supplies and toilet articles the moderate or high degrees of satisfaction should prove more effective. In the case of outdoor amusements and food there is a further suggestion that the satisfaction, if carried to the extreme, may lose somewhat in effectiveness.

A further interesting problem would be to determine whether current advertising seemed to follow the above principles or to run counter to any of them. This would necessitate the collection of a large number of advertising cuts and their ranking by a group of observers. A little evidence may be obtained by considering the twenty-three cuts used in the present experiment in the light of the commodities they had been originally used to advertise. Table IV shows how the commodities originally advertised by the

TABLE IV.

	U	V	W	X	Y	Z
Indoor amusements					1	1
Outdoor amusements			1	1		
Clothing	2	1				
Food		2	1	3	1	2
Smokers' supplies		1				
Toilet articles	1		2		2	

cuts used are distributed through the six degrees or groups of satisfaction. There were, of course, too few cuts for a given commodity to permit much generalization, but clothing, for instance, occurs only in classes U and V which was shown above to be a desirable situation. Outdoor amusements avoid U and V as they ought to. Food, smoking supplies and toilet articles for the most

part occur in the higher degrees but have some instances in U and V which according to the above findings is undesirable. Without more data on this point it would be rash to criticize advertising policies but the method just described if applied on a large scale would doubtless be illuminating.

The results of the main portion of the experiment are, of course, applicable only to the extent that the facial expression of a cut is a selling point in itself, i. e., the apparent satisfaction of the user is supposed to be an inducement to the reader to buy. There are many occasions when there is some other leading selling point and the facial expression is one designed to emphasize it. In such a case, the foregoing results would be irrelevant. At any rate it seems clear that the advertiser should not always strive to portray a maximum satisfaction in facial expressions but that the optimal degree varies with different commodities.

SUMMARY.

The foregoing experiment employed photographs posed by a subject feeling different degrees of satisfaction, and cuts from current advertisements portraying apparently various degrees of satisfaction. Individual and group methods were used. The observers stated the feelings suggested by the pictures, ranked them for apparent satisfaction and gave the commodities for which they thought each picture would be most effective in an advertisement. The results were tabulated to show the correspondence between actual satisfaction felt by the subject posing for the photographs and apparent satisfaction judged by the observer. The correlation proved to be very high.

The results were also treated in various ways to determine the optimal degree of apparent satisfaction for advertising different commodities. As far as the results go, the lesser degrees of satisfaction appear more suitable for advertising clothing and photographs, while the moderate or high degrees are better for amusements, food, smokers supplies and toilet articles.

The results are, of course, irrelevant when the facial expression of satisfaction is not itself a selling point, but in cases where it is a selling point the conclusion may be drawn that it is undesirable to always strive for the utmost satisfaction but that the optimal amount depends on the kind of commodity advertised.

COMPARATIVE SOCIAL TRAITS OF VARIOUS RACES, SECOND STUDY

By C. B. Davenport and Laura C. Craytor.

In "School and Society" for October 22, 1921, one of us published a study of "Comparative Social Traits of Various Races." This study was based on only 51 individuals and was confessedly fragmentary. It was published in the hope that it would stimulate others to make similar studies. How far this hope has been realized we can not say, but at least the first paper doubtless made it easier to secure cooperation of other teachers in collecting such data. The present study is due to the interest taken by Dr. R. S. Benedict of the Stuyvesant High School, who undertook to secure additional data from his pupils and to whom we are greatly indebted. These have doubled our totals. Since the latter are exclusively for boys, while the earlier were exclusively for girls it has seemed useful to combine the two collections to get results that may be expected to hold for the population as a whole. A comparison of the sexes is hardly possible with the small numbers available.

As stated in the earlier paper the purpose of the study is to replace opinion as to race differences in social traits by quantitative estimates.

The method is exactly the same in the two studies. The independent judgments of one to three teachers were obtained concerning ten traits of each pupil, using the graphic rating scale of the Scott Company, Philadelphia ("School and Society" XIV, p. 345). The data were tabulated and appraised as stated in the earlier paper. Probable errors have been calculated in order that the significance of the differences may be made clearer.[1] The results are tentative. It is hoped that this paper may stimulate to further studies of this subject.

RESULTS.

Altogether 188 sets of judgments were rendered on 102 persons, as follows: 20 on 10 Germans; 15 on 9 Irish; 37 on 22 Italians; 59 on 31 Austrians, and 57 on 30 Russians, also 116 on 61 Jews, being the sum of the Austrians and Russians, just listed.

There were calculated for each of these nationalities the mean of the judgments for each trait and the probable error of the mean. These means and probable errors are given in Table I. Thus under Germany, Leadership, we find the mean of the 20 estimates made on 10 persons to be 59.7 ± 3.0. This means that the position of students of German stock, in respect to leadership, was on the average slightly above mediocrity, or 50%. There is, however, an even chance that the true value (theoretically based on an infinite number) is only equally apt to occur within the range

56.7—62.7 as outside that range. It is usually held that differences between two means which are greater than three times the square root of the sum of the probable errors of the means is certainly a significant difference; that it depends not merely upon small numbers, but upon a real difference in the "set" of these numbers. For example, while the mean of 20 estimates concerning leadership of students from Germany is 59.7±3.0, that of 15 estimates of students born in Ireland is 38.3±5.0. There is, thus, a difference of 21.5 in the mean of the judgments for the two countries. The square root of the sum of the squares of the probable errors is 5.8. Three times 5.8 is 17.4 which is less than the difference of the means; hence the difference between the means is probably a biologically significant one. Even with the probable errors the "conclusions" must be held to be merely tentative; for the "probable error" has not the significance with small numbers that it has with large numbers.

TABLE I.

MEANS AND THEIR PROBABLE ERRORS.

Trait.	No. 1 Germany.	No. 2 Ireland.	No. 3 Italy.	No. 4 Austria.	No. 5 Russia.	No. 6 Jews.	Average of Means (unweighted)
I. Leadership.	59.7±3.0	38.3±5.0	37.7±3.2	46.6±2.6	44.7±2.4	45.6±1.8	45.4
II. Pertinacity.	67.2±3.2	55.0±4.3	52.8±2.8	58.8±2.0	57.6±2.0	58.2±1.4	58.3
III. Humor.	62.0±3.4	55.8±4.8	49.1±3.0	54.9±2.3	49.6±2.4	52.3±1.7	54.3
IV. Frankness.	56.5±2.8	48.6±3.8	47.7±2.6	55.1±2.0	50.9±2.0	53.0±1.4	51.8
V. Suspiciousness	38.4±3.3	46.6±2.2	42.4±2.0	45.8±1.8	47.7±1.5	46.7±1.2	44.2
VI. Sympathy.	54.7±1.8	42.3±4.4	48.2±2.0	48.6±1.8	51.3±1.5	49.9±1.2	49.0
VII. Loyalty.	79.8±2.4	76.0±2.2	77.9±1.2	71.1±1.5	74.6±1.3	72.8±1.0	75.9
VIII. Generosity.	75.8±2.2	72.7±1.8	73.7±2.1	71.4±1.6	72.7±1.9	72.0±1.2	73.3
IX. Obtrusiveness.	47.3±2.6	44.0±3.2	41.0±2.5	51.3±2.0	52.7±1.9	51.9±1.4	47.3
X. Coolness.	67.0±2.3	66.3±3.6	58.4±2.5	56.7±2.0	56.3±2.1	56.5±1.4	60.9
No. of Estimates.	20:10	15:9	37:22	59:31	57:30	116:61	

In Table I the means and probable errors are given for five nationalities, namely, pupils who came, or whose ancestors came, from Germany, Ireland, Italy, Austria and Russia. The students of Austrian and Russian stock in this New York City school are almost exclusively Jews. It seemed worth while to combine those from Austria and Russia under the heading of "Jews", and these results are given in column 6. Table I then should give us some sort of an answer, though imperfect, to the inquiry with which we started as to the difference in social traits of persons of different nationalities.

CONCLUSIONS.

While numbers are still insufficient to form final conclusions, the results suggest the following tentative conclusions.

In *leadership* the German children stand first at 59.7±3.0 points quite markedly above the others. The difference between this mean and that of the Jews is less than three times the probable error. Nevertheless the Jews may be considered as a race characterized by a medium leadership. On the other hand, the Irish and Italian are characterized by a low standard in leadership, and the difference between them and the middle group is, doubtless, significant.

In *pertinacity* the Germans stand first. This group is probably higher in respect to pertinacity than the Jews. The Irish and Italians stand lowest in this respect.

In *humor*, the German children stand first (62) and the Irish stand second. However, the difference between these two nationalities is not great and, indeed, not to be differentiated from the Austrians and the Jews in general. Between this group and the Italians there is probably a real difference in respect to national humor.

In *frankness* the German children again stand first (57) and the Jews, and especially the Austrians, are a close second. The Irish and Italians fell into a slightly lower class.

In *suspiciousness*, Jews and Irish stand above the others. Probably the Italians are not significantly lower. The Germans, however, are probably least in this respect and certainly are quite distinct from the Jews.

In *sympathy* the Germans stand highest, the Jews and Italians may be included in the medium category. The Irish are least in this respect.

In *loyalty*, the Germans stand highest, but in the same category are also the Italians and Irish. The Jews occupy a lower position.

In *generosity* the Germans, Italians, Irish and Jews stand at nearly the same level.

In *obtrusiveness* the 61 Jews stand at the top (52) and seem to

form a class distinct from the Germans, Irish and Italians which form a middle or lower group.

In *coolness* the Germans and Irish stand easily first (86). In a significantly lower group stand the Italians and Jews.

The 10 Germans stand at, or near the top in Leadership, Pertinacity, Humor, Frankness, Sympathy, and Loyalty, more than half the traits. They occupy a relatively low position in Suspiciousness.

The 9 Irish fall in the upper group in respect to Humor, Suspiciousness, Loyalty and Generosity, and in the lowest group in respect to Leadership, Pertinacity, Frankness and Sympathy.

The 22 Italians stand in the upper group in regard to Loyalty and Generosity and lowest in regard to Leadership and Humor.

The 61 Jewish children stand in the first group in Humor, Suspiciousness, Generosity, and Obtrusiveness and in the medium group for the other traits.

In addition to the mean values of the social traits for the different nationalities, there is a difference in the variability of judgments of persons from different countries, and it has seemed worth while to consider this variation. Accordingly, the standard deviations of the judgments for each nationality and trait are given in Table III. The probable errors have also been calculated as a means of judgment of significance, or rather, lack of significance of the difference of these indices of variability. Thus, from Table III, it appears that the variability in the judgments on Leadership is greatest for the Jews the standard deviation being 28.1 ± 1.3. It is least for the Germans, 20.0 ± 2.1. Although the difference may not be a significant one, there is a suggestion that the Jews (as represented in our statistics) include strains that vary more from each other in Leadership than in the case of the Germans.

On the other hand in Pertinacity, the Italians showed themselves the most variable and the Irish the least, although the difference, even in this case, is less than three times the probable error. Again in Humor the variability in judgments rendered on Italians, Jews and Irish are high, and for Germans somewhat lower. One of the striking differences in Table III is the slight variability of the Germans in regard to Coolness (15.2), a trait in which they stand at the top, and the variability of the Jews in this trait (22.8), a trait in which they stand at the bottom. Taking the average of the standard deviations of the ten traits for each of the nationalities, we find that the variation is greatest in the Jews, (21.8) and next in order in the Italians and Irish and least in the Germans.

From another standpoint it is interesting to compare the variability of the different traits for all nationalities. This average has been entered in the right hand column of Table III. The order of

the average variation for these ten traits is as follows: Leadership—26.5, Humor—25.6, Pertinacity—23.2, Frankness—21.6, Coolness—20.7, Obtrusiveness—20.4, Sympathy—18.2, Suspiciousness—17.7, Generosity—16.2, Loyalty—14.2.

The interpretation of the differences in averages of the ten traits is not easy. It may indicate a difference in the intrinsic variabilty of the traits or a difference in the ease or certainty of estimating them. One sees no inherent reason why it should be easier for teachers to estimate Loyalty of pupils than to estimate capacity for Leadership. It seems to me more probable that Loyalty is a trait in which students (in their teachers' opinions) stand uniformly rather high, and that Leadership is a quality in which they show great diversity.

[1]Dr. J. Arthur Harris calls my attention to the fact that the probable errors and the standard deviations upon which they are based are probably influenced, to some extent, by the fact that different teachers rated the different individuals; and one set of teachers rated a larger proportion of the German students than another set which treated, say, a larger proportion of the Irish. Thus any difference in the personal equation of these two groups of raters would be reflected in the magnitude of the variabilities. Representatives of the different races were, of course, distributed among the teachers without any conscious selection. Still it is true that the different pairs of raters did not rate an equal proportion of persons of the different nationalities; in other words, the different sets of raters did not play an equal part in determining the average rating of persons belonging to different nationalities. This introduces a further error which would only be overcome when larger numbers of students are rated.

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TABLE II.

RELATIVE POSITION OF THE DIFFERENT NATIONALITIES IN RESPECT TO MEAN JUDGMENTS ABOUT THEM.

	Leadership	Pertinacity	Humor	Frankness	Suspiciousness	Sympathy	Loyalty	Generosity	Obtrusiveness	Coolness
Highest Group	Germans	Germans	Germans Irish Jews	Germans	Jews Irish	Germans	Germans Italians Irish	No significant differences	Jews	Germans Irish
Middle Group	Jews	Jews		Jews	Italians	Jews Italians	Jews		Germans Irish Italians	Italians Jews
Lowest Group	Irish Italians	Irish Italians	Italians	Irish Italians	Germans	Irish				

TABLE III.

STANDARD DEVIATIONS AND THEIR PROBABLE ERRORS.

Trait.	No. 1 Germany.	No. 2 Ireland.	No. 3 Italy.	No. 4 Austria.	No. 5 Russia.	No. 6 Jews.	Averages of All Nations Columns 1-5
I. Leadership.	20.0±2.13	27.6±3.52	29.0±2.27	29.5±1.85	26.5±1.69	28.1±1.26	26.5
II. Pertinacity.	20.9±2.23	24.7±3.04	25.0±1.96	23.3±1.45	22.0±1.39	22.7±1.01	23.2
III. Humor.	22.6±2.42	26.4±3.37	26.6±2.12	25.8±1.60	26.7±1.69	26.4±1.17	25.6
IV. Frankness.	18.8±2.00	21.6±2.66	23.6±1.85	22.3±1.38	21.8±1.40	22.2±0.99	21.6
V. Suspiciousness.	21.6±2.31	12.5±1.54	17.4±1.40	20.3±1.27	16.6±1.06	18.6±0.83	17.7
VI. Sympathy.	12.0±1.28	24.2±3.08	17.3±1.40	20.9±1.31	16.5±1.05	19.8±0.88	18.2
VII. Loyalty.	15.7±1.67	12.5±1.54	10.2±0.82	17.5±1.09	14.9±0.94	16.4±0.73	14.2
VIII. Generosity.	14.7±1.57	9.7±1.29	18.6±1.48	18.0±1.15	19.9±1.32	19.0±0.87	16.2
IX. Obtrusiveness.	17.4±1.86	18.5±2.28	22.2±1.77	22.3±1.40	21.7±1.37	22.0±0.98	20.4
X. Coolness	15.2±1.63	20.6±2.54	22.4±1.78	22.8±1.41	22.7±1.46	22.8±1.02	20.7
Average of all Traits.	17.9	19.8	21.2	22.3	20.9	21.8	

A CONTRIBUTION TO THE TECHNIQUE OF PARTIAL CORRELATION

By C. L. Huffaker
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It is well recognized that the partial regression equation is the best tool for the study of many educational problems. This is particularly true if the problem involves (1) the analysis of a "general ability" into its component specific abilities, or (2) the determination of the diagnostic value of different tests. In the schema developed by Yule[1] the computation becomes very complicated and laborious if the number of variables is at all numerous. Methods of shortening the labor have been devised by Kelley[2] and Rosenow[3]. The schema devised by Rosenow requires only about half the labor of that of Kelley, but it has the very important shortcoming that the signs of all but two of the highest order coefficients are indeterminate. It necessarily follows that the signs of all the regression coefficients are indeterminate except two. This shortcoming imposes a serious limitation on the usefulness of Rosenow's schema. Both plans referred to above, make use of the fact, that usually the solution of such problems as have been indicated before requires only one regression equation.

The writer has devised a schema for solving problems in partial regression which involves the finding of fewer coefficients than either of the two plans cited before and at the same time avoids the approximation of Kelley's plan and the indeterminate signs of Rosenow's plan.

NUMBER OF COEFFICIENTS REQUIRED*

Variables	This plan		Yule		Kelley		Rosenow	
	Par.	Mul.	Par.	Mul.	Par.	Mul.	Par.	Mul.
3	2	2	3	1	2	1	2	2
4	9	2	19	1	15	1	9	3
5	22	2	61	1	36	1	22	4
6	46	2	240	0	78	1	45	5

This plan is outlined below. In the outline it is assumed that the reader has a working knowledge of the theory of correlation and of the notations of partial correlations as given by Yule.

The general problem before us is: given a dependent variable and a number of independent variables how can the maximum of information be obtained with the minimum of arithmetic? This

[1]Yule, G. Undy: *An Introduction to the Theory of Statistics*, 1919.
[2]Kelley Truman L.: *Chart to Facilitate the Calculation of Partial Coefficients of Correlation and Regression Equations*, 1921.
[3]Rosenow, Curt.: *The Analysis of Mental Functions*, Psych. Monographs, Vol. XXIV, No. 5, 1917.
*Number of coefficients needed for Kelley's and Rosenow's plans is from Rosenow op.cit.

problem may be divided into two sub-problems which are successive stages of a single operation. The two stages are: (1) The finding of the coefficients of partial correlation, with reference to the dependent variable, of the highest order; (2) The finding of the coefficients of regression (weights) for estimating the dependent variable.

In a problem involving four variables, the tables given below include all the partial correlation coefficients of all orders needed for finding the coefficients of the highest order with reference to the dependent variable.

First Order Coefficients	May be obtained from Zero Order Coefficients.		
$r_{12.4}$	r_{12}	r_{14}	r_{24}
$r_{13.2}$	r_{13}	r_{12}	r_{23}
$r_{13.4}$	r_{13}	r_{14}	r_{34}
$r_{14.2}$	r_{14}	r_{12}	r_{24}
$r_{23.4}$	r_{23}	r_{24}	r_{34}
$r_{34.2}$	r_{34}	r_{23}	r_{24}
Second Order Coefficients Needed	**May be obtained from First Order Coefficients.**		
$r_{12.34}$	$r_{12.4}$	$r_{13.4}$	$r_{23.4}$
$r_{13.24}$	$r_{13.4}$	$r_{12.4}$	$r_{23.4}$
$r_{14.23}$	$r_{14.2}$	$r_{13.2}$	$r_{34.2}$

The regression equation to be used in estimating the dependent variable is,

$$\overline{X}_1 = b_{12.34} X_2 + b_{13.24} X_3 + b_{14.23} X_4$$

In which X_1 is the estimated deviation from the mean of variable 1; X_2 observed deviation from the mean of variable 2 etc.

In addition to the coefficients given above the four standard deviations of the type $\sigma_{1.234}$ will be needed. Each of these may be found in three different ways, for example $\sigma_{1.234}$ may be found from:

$$\sigma^2_{1.234} = \sigma^2_1 (1-r^2_{12})(1-r^2_{13.2})(1-r^2_{14.23})$$
$$= \sigma^2_1 (1-r^2_{14})(1-r^2_{13.4})(1-r^2_{12.34})$$
$$= \sigma^2_1 (1-r^2_{13})(1-r^2_{14.3})(1-r^2_{12.34})$$

It is now possible to select formulae for the standard deviations needed in such a way that all the coefficients used occur in the tables of partial coefficients given above. The formulae selected in this case are:

$$\sigma^2_{1.234} = \sigma^2_1 (1-r^2_{12})(1-r^2_{13.2})(1-r^2_{14.23})$$
$$\sigma^2_{2.134} = \sigma^2_2 (1-r^2_{24})(1-r^2_{23.4})(1-r^2_{12.34})$$

$$\sigma^2_{3.124} = \sigma^2_3 (1-r^2_{34})(1-r^2_{23.4})(1-r^2_{13.24})$$
$$\sigma^2_{4.123} = \sigma^2_4 (1-r^2_{24})(1-r^2_{34.2})(1-r^2_{14.23})$$

As a check on the arithmetic of the operation, it is well to find multiple R in two different ways, namely by

$$1-R^2_{1(234)} = \sigma (1-r^2_{12})(1-r^2_{13.2})(1-r^2_{14.23})$$
$$1-R^2_{1(234)} = \sigma (1-r^2_{14})(1-r^2_{13.4})(1-r^2_{12.34})$$

This furnishes an absolute check on all the work except that of $r_{13\cdot24}$ and the coefficients that are used in finding it are checked for their accuracy. There is no check on the arithmetic of the stand deviations included in the plan. However, if a check is desired, they may be found from the following equations, after $r_{24\cdot1}$ has been calculated from r_{21}, r_{23}, and r_{34}.

$$\sigma^2_{1.234} = \sigma^2_1 (1-r^2_{14})(1-r^2_{13.4})(1-r^2_{12.34})$$
$$\sigma^2_{2.134} = \sigma^2_2 (1-r^2_{23})(1-r^2_{24.3})(1-r^2_{12.34})$$
$$\sigma^2_{3.124} = \sigma^2_3 (1-r^2_{23})(1-r^2_{34.2})(1-r^2_{13.24})$$
$$\sigma^2_{4.123} = \sigma^2_4 (1-r^2_{34})(1-r^2_{24.3})(1-r^2_{14.23})$$

In using this plan it should be held in mind that the different partial coefficients are obtained from the column headed "May be obtained from" by substitution in the general formula

$$r_{12.34\ldots n} = \frac{r_{12.34\ldots(n-1)} - r_{1n.34\ldots(n-1)} \cdot r_{2n.34\ldots(n-1)}}{\sqrt{1-r^2_{1n.34\ldots(n-1)}}\ \sqrt{1-r^2_{2n.34\ldots(n-1)}}}$$

In each case, the first coefficient given becomes the first term of the numerator and the second and third the product-term on the numerator. The second and third coefficients likewise appear in the $1-r^2$ of the denominator. For example:

$$r_{12.4} = \frac{r_{12} - r_{14} \cdot r_{24}}{\sqrt{1-r^2_{14}}\ \sqrt{1-r^2_{24}}}$$

$$r_{12.34} = \frac{r_{12.4} - r_{13.4} \cdot r_{23.4}}{\sqrt{1-r^2_{13.4}}\ \sqrt{1-r^2_{23.4}}}$$

The regression coefficients are obtained by substitution in the general formula

$$b_{12.34..n} = r_{12.34..n} \frac{\sigma_{1.234...n}}{\sigma_{2.134...n}}$$

For example $b_{12.34}$ and $b_{13.24}$ are given by the formulae

$$b_{12.34} = r_{12.34} \frac{\sigma_{1.234}}{\sigma_{2.134}}$$

$$b_{13.24} = r_{13.24} \frac{\sigma_{1.234}}{\sigma_{3.124}}$$

For five variables the equation becomes

$$X_1 = b_{12.345} X_2 + b_{13.245} X_3 + b_{14.235} X_4 + b_{15.234} X_5$$

and may be solved by the following outline using the same checks given for four variables, after extending them to include the extra variable.

Fist Order Coefficients Needed	May be obtained from Zero Order Coefficients		
$r_{12.5}$	r_{12}	r_{15}	r_{25}
$r_{13.2}$	r_{13}	r_{12}	r_{23}
$r_{13.5}$	r_{13}	r_{15}	r_{35}
$r_{14.2}$	r_{14}	r_{12}	r_{24}
$r_{14.5}$	r_{14}	r_{15}	r_{45}
$r_{15.2}$	r_{15}	r_{12}	r_{25}
$r_{23.5}$	r_{23}	r_{25}	r_{35}
$r_{24.5}$	r_{24}	r_{25}	r_{45}
$r_{34.2}$	r_{34}	r_{23}	r_{24}
$r_{34.5}$	r_{34}	r_{35}	r_{45}
$r_{35.2}$	r_{35}	r_{23}	r_{25}
$r_{45.2}$	r_{45}	r_{24}	r_{25}

Second Order Coefficients Needed	May be obtained from First Order Coefficients		
$r_{12.45}$	$r_{12.5}$	$r_{14.5}$	$r_{24.5}$
$r_{13.45}$	$r_{13.5}$	$r_{14.5}$	$r_{34.5}$
$r_{14.23}$	$r_{14.2}$	$r_{13.2}$	$r_{34.2}$
$r_{15.23}$	$r_{15.2}$	$r_{13.2}$	$r_{35.2}$
$r_{23.45}$	$r_{23.5}$	$r_{24.5}$	$r_{34.5}$
$r_{45.23}$	$r_{45.2}$	$r_{35.2}$	$r_{34.2}$

Third Order Coefficients Needed	May be obtained from Second Order Coefficients		
$r_{12.345}$	$r_{12.45}$	$r_{13.45}$	$r_{23.45}$
$r_{13.245}$	$r_{13.45}$	$r_{12.45}$	$r_{23.45}$
$r_{14.235}$	$r_{14.23}$	$r_{15.23}$	$r_{45.23}$
$r_{15.234}$	$r_{15.23}$	$r_{14.23}$	$r_{45.23}$

The formulae for the standard deviations are:

$$\sigma^2_{1.2345} = \sigma^2_1 (1-r^2_{12})(1-r^2_{13.2})(1-r^2_{14.23})(1-r^2_{15.234})$$

$$\sigma^2_{2.1345} = \sigma^2_2 (1-r^2_{25})(1-r^2_{24.5})(1-r^2_{23.45})(1-r^2_{12.345})$$

$$\sigma^2_{3.1245} = \sigma^2_3 (1-r^2_{35})(1-r^2_{34.5})(1-r^2_{23.45})(1-r^2_{13.245})$$

$$\sigma^2_{4.1235} = \sigma^2_4 (1-r^2_{24})(1-r^2_{34.2})(1-r^2_{45.23})(1-r^2_{14.235})$$

$$\sigma^2_{5.1234} = \sigma^2_5 (1-r^2_{25})(1-r^2_{35.2})(1-r^2_{45.23})(1-r^2_{15.234})$$

Formulae for the b's are

$$b_{12.345} = r_{12.345} \frac{\sigma_{1.2345}}{\sigma_{2.1345}}$$

$$b_{13.245} = r_{13.245} \frac{\sigma_{1.2345}}{\sigma_{3.1245}}$$

etc.

The equation for six variables is:

$$X_1 = b_{12.3456} X_2 + b_{13.2456} X_3 + b_{14.2356} X_4 + b_{15.2346} X_5 + b_{16.2345} X_6$$

The plan for six variables is given below and is subject to the same checks as the problems with a smaller number of variables.

Fist Order Coefficients Needed	May be obtained from Zero Order Coefficients		
$r_{12.6}$	r_{12}	r_{16}	r_{26}
$r_{13.2}$	r_{13}	r_{12}	r_{23}
$r_{13.6}$	r_{13}	r_{16}	r_{36}
$r_{14.2}$	r_{14}	r_{12}	r_{24}
$r_{14.6}$	r_{14}	r_{16}	r_{46}
$r_{15.2}$	r_{15}	r_{12}	r_{25}
$r_{15.6}$	r_{15}	r_{16}	r_{56}
$r_{16.2}$	r_{16}	r_{12}	r_{26}
$r_{23.6}$	r_{23}	r_{26}	r_{36}
$r_{24.6}$	r_{24}	r_{26}	r_{46}
$r_{25.6}$	r_{25}	r_{26}	r_{56}
$r_{34.2}$	r_{34}	r_{23}	r_{24}
$r_{34.6}$	r_{34}	r_{36}	r_{46}
$r_{35.2}$	r_{35}	r_{23}	r_{25}
$r_{35.6}$	r_{35}	r_{36}	r_{56}
$r_{36.2}$	r_{36}	r_{23}	r_{26}
$r_{45.2}$	r_{45}	r_{24}	r_{25}
$r_{45.6}$	r_{45}	r_{46}	r_{56}
$r_{46.2}$	r_{46}	r_{24}	r_{26}
$r_{56.2}$	r_{56}	r_{25}	r_{26}
Second Order Coefficients Needed	**May be obtained from First Order Coefficients**		
$r_{12.56}$	$r_{12.6}$	$r_{15.6}$	$r_{25.6}$
$r_{13.56}$	$r_{13.6}$	$r_{15.6}$	$r_{35.6}$

$\Gamma^{14.23}$	$\Gamma^{14.2}$	$\Gamma^{13.2}$	$\Gamma^{34.2}$
$\Gamma^{14.56}$	$\Gamma^{14.6}$	$\Gamma^{15.6}$	$\Gamma^{45.6}$
$\Gamma^{15.23}$	$\Gamma^{15.2}$	$\Gamma^{13.2}$	$\Gamma^{35.2}$
$\Gamma^{16.23}$	$\Gamma^{16.2}$	$\Gamma^{13.2}$	$\Gamma^{36.2}$
$\Gamma^{23.56}$	$\Gamma^{23.6}$	$\Gamma^{25.6}$	$\Gamma^{35.6}$
$\Gamma^{24.56}$	$\Gamma^{24.6}$	$\Gamma^{25.6}$	$\Gamma^{45.6}$
$\Gamma^{34.56}$	$\Gamma^{34.6}$	$\Gamma^{45.6}$	$\Gamma^{35.6}$
$\Gamma^{45.23}$	$\Gamma^{45.2}$	$\Gamma^{35.2}$	$\Gamma^{34.2}$
$\Gamma^{46.23}$	$\Gamma^{46.2}$	$\Gamma^{34.2}$	$\Gamma^{36.2}$
$\Gamma^{56.23}$	$\Gamma^{56.2}$	$\Gamma^{35.2}$	$\Gamma^{36.2}$

Third Order Coefficients Needed	May be obtained from Second Order Coefficients		
$\Gamma^{12.356}$	$\Gamma^{12.56}$	$\Gamma^{13.56}$	$\Gamma^{23.56}$
$\Gamma^{12.456}$	$\Gamma^{12.56}$	$\Gamma^{14.56}$	$\Gamma^{24.56}$
$\Gamma^{13.456}$	$\Gamma^{13.56}$	$\Gamma^{14.56}$	$\Gamma^{34.56}$
$\Gamma^{14.356}$	$\Gamma^{14.56}$	$\Gamma^{13.56}$	$\Gamma^{34.56}$
$\Gamma^{15.234}$	$\Gamma^{15.23}$	$\Gamma^{14.23}$	$\Gamma^{45.23}$
$\Gamma^{16.234}$	$\Gamma^{16.23}$	$\Gamma^{14.23}$	$\Gamma^{46.23}$
$\Gamma^{23.456}$	$\Gamma^{23.56}$	$\Gamma^{24.56}$	$\Gamma^{34.56}$
$\Gamma^{24.356}$	$\Gamma^{24.56}$	$\Gamma^{23.56}$	$\Gamma^{34.56}$
$\Gamma^{56.234}$	$\Gamma^{56.23}$	$\Gamma^{45.23}$	$\Gamma^{46.23}$

Fourth Order Coefficients Needed	May be obtained from Third Order Coefficients		
$\Gamma^{12.3456}$	$\Gamma^{12.456}$	$\Gamma^{13.456}$	$\Gamma^{23.456}$
$\Gamma^{13.2456}$	$\Gamma^{13.456}$	$\Gamma^{12.456}$	$\Gamma^{23.456}$
$\Gamma^{14.2356}$	$\Gamma^{14.356}$	$\Gamma^{12.356}$	$\Gamma^{24.356}$
$\Gamma^{15.2346}$	$\Gamma^{15.234}$	$\Gamma^{16.234}$	$\Gamma^{56.234}$
$\Gamma^{16.2345}$	$\Gamma^{16.234}$	$\Gamma^{15.234}$	$\Gamma^{56.234}$

Formulae for standard deviations,

$$\sigma^2_{1.23456} = \sigma^2_1 (1-r^2_{16})(1-r^2_{15.6})(1-r^2_{14.56})(1-r^2_{13.456})(1-r^2_{12.3456})$$

$$\sigma^2_{2.13456} = \sigma^2_2 (1-r^2_{26})(1-r^2_{25.6})(1-r^2_{24.56})(1-r^2_{23.456})(1-r^2_{12.3456})$$

$$\sigma^2_{3.12456} = \sigma^2_3 (1-r^2_{36})(1-r^2_{35.6})(1-r^2_{34.56})(1-r^2_{23.456})(1-r^2_{13.2456})$$

$$\sigma^2_{4.12356} = \sigma^2_4 (1-r^2_{46})(1-r^2_{45.6})(1-r^2_{34.56})(1-r^2_{24.356})(1-r^2_{14.2356})$$

$$\sigma^2_{5.12346} = \sigma^2_5 (1-r^2_{25})(1-r^2_{35.2})(1-r^2_{45.23})(1-r^2_{56.234})(1-r^2_{15.2346})$$

$$\sigma^2_{6.12345} = \sigma^2_6 (1-r^2_{26})(1-r^2_{36.2})(1-r^2_{46.23})(1-r^2_{56.234})(1-r^2_{16.2345})$$

Formulae for the b's are:

$$b_{12.3456} = r_{12.3456} \frac{\sigma_{1.23456}}{\sigma_{2.13456}}$$

$$b_{13.2456} = r_{13.2456} \frac{\sigma_{1.23456}}{\sigma_{3.12456}}$$

etc.

The same plan of selection can be used for any number of variables with the same proportionate saving of labor. The use of Kelley's Chart referred to before is possible with four variables, but is not recommended for more than that number. For five and six variables the writer recommends the use of such tables as Miner's[1] and a calculating machine. By the use of these tables and a calculating machine it is possible to solve a problem of six variables correct to four places in three hours, after the Zero Order Coefficients have been found.

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[1]Miner, *Tables of* $1-r^2$ *and* $\sqrt{1-r^2}$ John Hopkins Press, 1922.

THE RELATION BETWEEN THE INTELLIGENCE AND VOCATIONAL CHOICES OF HIGH SCHOOL PUPILS

By Gustave A. Feingold
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In the varied literature on vocational guidance and vocational education, one finds that almost nothing has been done in the attempt to correlate the vocational choices of high school pupils with their mentality.[1] Yet if vocational guidance is to be put on a scientific as well as practical basis, this is the very first thing that should be done. The chief function of the vocational adviser in the high school should be to save pupils of high mental ability from entering occupations of limited opportunity, on the one hand, and to advise others of little ability against trying to enter occupations for which they have not the intellectual foundation, on the other hand.

In the September 2, 1922, issue of School and Society there appears an article on Occupational-Intelligence-Standards[2] wherein is presented an intelligence scale grouping some ninety-six different occupations into various Army Alpha scores, based on the results of the occupational studies made by the Division of Psychology, S. G. O.; and reported in the now famous Volume XV, Memoirs of National Academy of Sciences.

With this Occupational-Intelligence Scale before us, there was at hand a means for comparing the vocational choices of high school pupils with their intelligence grades, in order to determine whether they overrated or underrated their abilities, and to what extent.

All occupational-intelligence scales are based on the assumption that certain vocations are within reach of certain mental levels. One group of vocations is within reach of "A" intelligence, another within reach of "C" intelligence, and so forth. If a high school pupil of a certain mental level, "D," let us say, desires to enter a vocation which belongs to a much higher level, like "B", he overestimates his ability by two degrees. The assumption is that he will either not succeed in entering his desired vocation, or if he does, the probability is that he will not be efficient in it. On the other hand, if a boy expects to enter an occupation that belongs to a much lower mental level than his own, the community loses by that choice, inasmuch as it does not get from him the best and

[1] In the 183 titles on *The Psychology of Vocational Selection* reviewed by A. W. Krohnhauser, Psy. Bull. Vol. 19, No. 4, 1922, not one seems to deal specifically with the above problem.

[2] Douglas Fryer, *Occupational-Intelligence Standards*, School and Society, Sept. 2, 1922, p. 276.

utmost service that he is capable of rendering, nor will he be happy because he will not have the full opportunity to express his entire personality in it. This is an important matter, for about 50 per cent of all high school pupils make up their minds with respect to their future calling even before they enter school, and about 80 per cent of these cling to their original choice throughout their school career. Our problem, therefore, was to find out to what extent high school pupils make or express vocational choices that are within reach of their mentality.

To be sure, the alpha scores given for the various occupational groups in Fryer's table were attained by individuals whose schooling, for the most part, lay from five to fifteen years behind them; and, in view of the fact that when the youth gets out of school he is bound, more or less, to get into a rut of thinking and acting, it is inevitable that he should strike a lower score in an intelligence test then, than he would have done when he was at the height of his school days.[3] This is demonstrated by the fact that in the relative mental ranks of the various occupational groups in the afore-mentioned Volume XV, the "student" is placed third from the top, apparently above the physician, above the clergyman, and above the accountant, notwithstanding the fact that all of these have been students at one time in their lives.[4] Consequently, a certain amount of caution had to be exercised in comparing the intelligence grades of high school individuals with those of mature persons in various occupational groups. For, a high school senior may readily score 127 points, which is the average for the physician group on the Occupational-Intelligence Scale referred to, and yet be woefully deficient in mentality for the medical profession. In other words, his relatively high score may be due to the educational increment, which is bound to innure to high school pupils of every grade of mentality by virtue of their constant immersion, forced or otherwise, in the educational waters.[5] It was, therefore, necessary to strike a group of high school pupils not too long domiciled in the realm of secondary education, on the one hand, and among whom there would be found a mental level that would correspond, in points scored, to the mentality of some definite occupational group in Fryer's scale, on the other hand.

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[3]Since the above was written Margaret V. Cobb's *The Limits Set to Educational Achievement by Limited Intelligence*, Jour. Educ. Psy. Vol. XIII No. 6, 1922, has made its appearance and from the figures presented in Table VIII, one may infer that those who have had only one year of high school education, will, 15 years later, score seven points more than they did as high school freshmen, those who left high school at the end of the sophomore year will, 15 years later, score five points less than as sophomores, adults of three years' high school training will score 10 less than they did as juniors and those of four years high school will score 20 points less than they did as high school seniors.

[4]Mem. Nat. Ac Sc. Vol. XV, p. 836.

[5]For substantiation of this see Cobb Op. cit. p. 462-463.

Now it happened that in June, 1922, all prospective Freshmen of the Hartford Public High School, some 1200 in number, were given a modified Army Alpha test and the passing mark was set at 76 points, equivalent to an I. Q. of 103 and to 50 per cent intelligence on our scale of 100. By dividing that scale into ten deciles, the uppermost, or "A" mental level, corresponded exactly with the occupational groups that fell into the "A" mental level on Fryer's scale. Thereafter, it was merely necessary to draw lines through all corresponding points of division on the Fryer scale and note whether the vocational choice made by a pupil of a given degree of intelligence fell within his mental level on the converted scale or not.

In one respect Fryer's Occupational-Intelligence Scale is unsatisfactory for high school purposes in that it is not sufficiently complete in the matter of vocations. No provision is made in it for the professions of law, banking, journalism, high school and college teaching, nor for teachers of music, gymnastics, and cooking. Yet, there must have been hundreds of lawyers, high school teachers, college professors, bank tellers, not to mention instructors of gymnastics, enrolled in the army. In an intelligence test given to fifty-five high school teachers, the writer found that their median on the Army Alpha test was 162 points, with a variation that ranged from 94 to 199. Also, in the occupational studies made by the Division of Psychology, S. G. O., lawyers are ranked second from the top. The writer felt justified, therefore, in placing lawyers, journalists, high school and college teachers in the "A" class on Mr. Fryer's scale. Authors and bankers were placed in the modified "B" group. Music, gymnasium, elocution, and cooking teachers, professions selected by high school pupils, as well as the indefinite profession "business", so frequently chosen by high school boys and girls, were placed in the modified "D" group. Among girls, those who chose dressmaking as their vocational ambition, were classified with tailors, and hair-dressers with barbers.

Investigations conducted by various psychologists have demonstrated that the I. Q. does not change appreciably. The writer has thus far retested two high school classes at intervals of two years and has found practically no change in the average I. Q. attained by the same pupils as Freshmen, and two years later as Juniors. Thus, the average I. Q. of 288 Freshmen who had entered the Hartford High School in September, 1920, was 111; their average age having been 14 years and 6 months, and the average number of points scored by them on the writer's modified Alpha test having

[6]Their educational mental increment was about 5 Alpha points. Deducting that number from 116 gives them an I. Q of 102. This harmonizes with theory—as the normal individual approaches adult mentality his I. Q. should approach 100.

been 96, which is equivalent to a mental age of 16 years and 2 months. The average number of points scored by these same 288 pupils in September, 1922, when they became Juniors was 116, which is equivalent to the mental age of 17 years and 1 month; their average I. Q. was consequently 104.[6]

By adopting a percentage scale of mental alertness, the base of which is 152 points, equivalent to 100 per cent intelligence, for high school Freshmen tested three weeks before graduation from grammar school, and a scale with a base of 172 points for Sophomores, one with a base of 186 points for Juniors, and one with a base of 196 points for Seniors, the latter three groups tested at the beginning of their class careers, the writer has found but little displacement from one mental level to the other as the pupils progressed from the Freshman to the Senior year and were subjected to two separate tests.

Thus, the average per cent of intelligence for the above mentioned 288 pupils, rated by their Freshman scores, was 59.0, and their average intelligence two years afterwards, rated by their Junior scores, was 62.3. The coefficient of correlation between the Freshman and Junior scores was $+.875 \pm .009$. Fifty, on a scale of 100, being the minimum requirement for passing our high school intelligence test, the corresponding passing I. Q.'s for the Freshman, Sophomore, Junior, and Senior classes are, respectively, 103, 101, 98, and 95. The following table gives the points scored, per cent intelligence, and letter grade for each mental level in the four high school classes.

TABLE I.

COMPARATIVE INTELLIGENCE SCALES FOR HIGH SCHOOL CLASSES.

(To be applied to the last three at the beginning of their class careers)

	POINTS SCORED				
Freshmen	Sophomores	Juniors	Seniors	% Int.	Letter Grade
137-152	155-172	167-186	176-196	90-100	A
121-136	138-154	148-166	156-175	80-89	B
106-120	120-137	130-147	136-155	70-79	C
91-105	103-119	111-129	116-135	60-69	D
76-90	86-102	92-110	96-115	50-59	E
61-75	69-85	74-91	76-95	40-49	F
45-60	58-68	55-73	56-75	30-39	G
44 & Less	51 & Less	54 & Less	55 & Less	29 & Less	H

If now we take Fryer's Occupational-Intelligence Scale, modified so as to include the professions frequently chosen by high school pupils, and then group into the various mental grades the professions that naturally fall into them by virtue of the average points scored by the members in each group, we obtain the following Oc-

cupational-Intelligence Scale especially adapted for high school pupils, and, though based on the intelligence achievements of high school Freshmen, is none the less applicable to upper classmen, when attention is paid to the letter grade in mentality instead of points scored.

TABLE II.

OCCUPATIONAL-INTELLIGENCE SCALE FOR HIGH SCHOOL PUPILS.

Letter Grade	Av. I. Q.[7]	Av. Points	No.	Occupation
		162		Teacher (College & High)
		161		Engineer (Civil & Mech.)
A	126	?	141	Lawyer
		?		Journalist
		152		Clergyman
		137		Accountant
		127		Physician
		?		Novelist
B	122	122	126	Teacher (Grades)
		?		Banker
		119		Chemist
		114		Draftsman
C	116	111	110	Secretary (Private & Institutional)
		110		Dentist
		109		Executive, minor
		103		Stenographer & Typist
		101		Bookkeeper
		99		Nurse
		96		Clerk (office)
D	110	91	95	Clerk (railroad)
		?		"Business"
		?		Gymnasium Teacher
		?		Cooking Teacher
		?		Music Teacher
		?		Elocution Teacher
		86		Photographer
		85		Telegrapher & Radio Operator
		82		Musician (Band & Orchestra)
		81		Artist (Sign Letterer)
E	103	81	80	Clerk (Postal)
		81		Electrician
		80		Foreman (Construction)
		78		Druggist
		77		Foreman (Factory)

[7]Derived from the Freshmen scores and ages in each group.

		70		Telephone Operator
		69		Carpenter (Ship)
		69		**Policeman & Detective**
		68		Auto Assembler
		67		**Tool Maker**
		66		**Plumber**
F	95	65	65	Lath Hand (Production)
		65		Auto Mechanic (General)
		65		Auto Chauffeur
		65		Tailor
		?		**Dressmaker**
		?		**Milliner**
		63		**Machinist** (General)
		62		**Actor (Vaudeville)**
		60		Printer
		60		**Carpenter** (General)
		59		Painter
		58		**Farmer**
G	80	58	55	Brick Layer
		57		Caterer
		55		Barber
		?		**Hair Dresser**
		52		**Sales Clerk**
		40		Hospital Attendent
H	84	32	35	Sailor
		31		Structural Steel Worker

Not all of the occupations given in Fryer's scale are included in this modified one. Only those which were chosen at least once among the 512 pupils who expressed their vocational preference are given a place in it. These are printed in heavy type. The remaining occupations are included as ones which the writer thought high school pupils might possibly choose, at least temporarily; also in order to serve as a means of comparison between the different types of vocational mental levels.

Let us now see what the 512 high school Freshmen actually did in the matter of choosing a vocation or indicating a vocational preference. Table III shows the degrees and the direction of variation of vocational choice from mental level among the 250 boys. The numbers +5, +4, +3, etc., represent the number of mental levels, above that of the individual, wherein lay the vocation he chose. Minus one, —2, etc., indicate the number of mental levels

below that of the individual wherein lay the profession he selected. The letters in the squares show in what mental level lay the vocation chosen; the numbers in the squares represent the number of pupils making that choice.

The above table snows some astonishing results. There is a conspicuous tendency for the superior pupils, those of "A" and "B" mentality, to underrate their ability and to choose a profession that falls in a mental level considerably below their own. And there is a still greater tendency for pupils of low mentality to choose professions that lie considerably above their mental levels. To be sure, the choosing of a profession that lies within one mental level above or below the one to which a particular individual belongs is no serious mistake. It is perfectly safe to assume that an individual of "B" mentality is quite able to pursue a profession that lies in the "A" mental level, provided he puts forth enough industry. Likewise, there is no reason to suppose that a pupil of "C" mentality is throwing his future away entirely merely by choosing a profession that belongs to the "D" mental level. Therefore, in the treatment of the data presented in Tables III and IV we shall consider all individuals who vary but one degree in either direction as having made a proper vocational choice. It is only those whose vocational choice lies within two or more mental levels above or below their own who will be considered as not having chosen wisely.

With this proviso before us we find that of the thirty superior boys only 20, or 66.6 per cent, make a proper choice, whereas 33.3 per cent choose some profession that requires far less ability than they possess, as judged by the intelligence tests. Of course, for the "A" pupils, there was no alternative but to choose a profession that lay either within their mental level or in some lower level; but why should three of the four "A" boys choose vocations that are so far below their own mental grade? The "B" pupils seem to show somewhat more courage, as well as more wisdom, than the "A" individuals, in choosing their vocations; inasmuch as 73 per cent of them select vocations that fall within their mental capacity. Among the boys of "C" ability only 44 per cent seem to make a proper choice, while the number that overrate their ability is twice as large as those who underrate it. When we come to those who failed in the intelligence tests, having scored a grade of "F" and lower, which is equivalent to 76 points and less on the Army Alpha scale, we find that no less than 88 per cent of them select professions that are anywhere from two to five mental levels above their own.

To be sure the claim may be made, and justly too, that the so-called professions lie within the three highest mental levels, and

inasmuch as the very presence of boys in high school already indicates a leaning toward some profession, it is only natural that they should tend to overrate their ability, as judged by their vocational preference, rather than to underrate it. But this simply shifts the argument back one step by taking the problem out of the high school and placing it within the grammar school and home. It merely means that American children tend to overrate their ability even before they get into high school. Judged by the large proportion of high school failures, it being something like 60 per cent, one must say that the above statement is not far from being accurate. Moreover it is significant to note that among the mental failures a larger proportion, fully 48 per cent, choose a profession that lies in the "A" and "B" levels than do the pupils of either "E" or "D" ability, the percentages of excessive vocational overreaching in their cases being 40 and 42, respectively. In other words, the distribution table plainly shows that the lower an individual stands in mentality, the higher seems to be his vocational ambition. Whether this is a manifestation of compensation, the desire filling the gap within the mind, or whether it is simply a further indication of poor judgment and inability to envisage the future in matters practical as well as ideal, is a topic for separate discussion.

Nevertheless, there is sufficient evidence at hand to indicate that it is the latter and not entirely the former. Investigating the proportion of pupils in the various mental levels who survived the high school curriculum for at least two years, the writer has found that in the Hartford Public High School fully 73 per cent of those who fail in intelligence at the beginning of their Freshman year do not succeed in becoming Juniors. Either they drop out of school altogether, or remain in a lower class because of poor scholarship. According to Cobb,[8] 87 per cent of the Freshmen who score below 77.5 points drop out before the Senior year in the Michigan high schools, and in Madsen's group about 84 per cent of such individuals drop out. Now, in view of the fact that the professions within the "A" and "B" groups require considerably more than mere high school training, it is quite obvious that of the thirty-seven "F" and "G" mental level pupils who selected professional occupations for their career, practically three-quarters of them will not proceed far enough in higher training even to come within reach of a high school diploma. Once more according to Cobb, only about 4.5 per cent of them may be expected to enter college.[9]

[8] *The Limit Set to Educational Achievement by Limited Intelligence*, Jour. Edu. Psy., Vol. XVIII, No. 8, p. 464.
[9] Op. cit. Table IX, p. 469.

TABLE III.

DEGREE AND DIRECTION OF VARIATION OF VOCATIONAL CHOICE FROM MENTAL LEVEL AMONG BOYS.

Degrees of Variation	+5	+4	+3	+2	+1	0	-1	-2	-3	-4	-5	Total	Per Cent
Mental Level													
A						1 A	B	C	2 D	E	1 F	4	1.6
B					14 A	5 B	C	3 D	1 E	2 F	1 G	26	10.4
C				14 A	7 B	2 C	8 D	2 E	5 F			38	15.2
D			21 A	8 B	3 C	25 D	7 E	4 F	1 G			69	27.6
E		15 A	5 B	C	20 D	4 E	4 F					48	19.2
F	20 A	5 B	6 C	12 D	3 E	1 F	2 G					49	19.6
G	6 B	C	5 D	2 E	1 F	1 G						15	6.0
H			1 E	F	G	H						1	0.4
Total	26	20	38	36	48	39	21	9	9	2	2	250	
Per Cent	10.4	8.0	15.2	14.4	19.2	15.6	8.4	3.6	3.6	0.8	0.8		100.0
	48.0%					43.2%			8.8%				

TABLE IV.

DEGREE AND DIRECTION OF VARIATION OF VOCATIONAL CHOICE FROM MENTAL LEVEL AMONG GIRLS

Degrees of Variation	+ 5	+ 4	+ 3	+ 2	+1	0	-1	-2	-3	-4	-5	Total	Per Cent
Mental Level													
A						A	2 B	1 C	2 D	E	1 F	6	2.3
B					1 A	9 B	1 C	6 D	E	1 F		18	6.9
C				2 A	13 B	2 C	14 D	1 E	1 F			33	12.6
D			1 A	18 B	1 C	34 D	3 E	2 F	1 G			60	22.8
E		4 A	17 B	C	42 D	2 E	1 F					66	25.2
F		14 B	C	42 D	E	F						56	21.4
G	4 B	C	14 D	E	1 F	G						19	7.3
H	1 C	3 D	E	F	G	H						4	1.5
Total	5	21	32	62	58	47	21	10	4	1	1	262	
Per Cent	1.9	8.0	12.2	23.7	22.1	18.0	8.0	3.81	1.5	0.4	0.4		100
	45.8%					48.1%			6.1%				

To judge by the professions these 250 boys wish to enter, we may say that ten per cent overrate their ability by five mental levels, eight per cent overrate themselves by four mental levels, 15 per cent by three mental levels, and 14 per cent by two mental levels. In brief, 48 per cent of all the boys overrate their ability by choosing a profession that lies in a mental level that is from two to five grades above their own. Forty-three and two tenths per cent seem to choose wisely, in that the profession they select lies within a mental level that varies only one degree from their own. Eight and eight tenths per cent underrate their ability by choosing a vocation that lies in a mental level which is two or more grades below theirs. The coefficient of correlation between the intelligence and vocational choices of these 250 boys is $+.045 \pm .042$. Practically zero.

Fryer's Occupational-Intelligence-Scale does not lend itself very readily for the classification of girls in the same manner as boys, for the very good reason that the occupations considered are chiefly those for men. Nevertheless, it contains the professions of teacher, stenographer and typist, bookkeeper, nurse, and clerk, which constitute nearly 90 per cent of the professions selected by high school girls. By including the professions of music, cooking and gymnasium teachers with the class of bookkeepers, nurses and stenographers, as we have done, we have, it seems, made provision for practically every profession that a high school girl would be likely to choose. With these additions, we were surprised to discover that of the 262 girls, who indicated their professional choice, only one selected a vocation for which no provision could be made on this modified Occupational Scale, and that one was acting, presumably in drama. Tabulating the girls in the same manner as we did the boys, we obtain Table IV. which shows the extent and the direction in which their vocational choice varies from their mental level.

The similarity in the distribution curve for boys and girls is remarkable. Here, too, we find that 45.8 per cent of the girls overrate their ability by choosing vocations that lie within two or more mental levels above their own. Forty-eight and one tenth per cent make a proper choice and 6.1 per cent underrate themselves. The coefficient of correlation between intelligence and vocational choice for the girls is $+.0987 \pm .041$. In spite of the fact that the scale was based on vocations pursued by men, we find that it is applicable to girls, and, indeed, girls seem to choose their vocations a little more intelligently than do the boys.

Before summing up the results of our study, we must once more forestall the probable objection that the reason why these pupils tend to overrate themselves by choosing vocations that lie so high above their own mental levels is because their intelligence has been judged too early in the stage of mental development. There is no ground for such criticism. First, be-

cause the average mental age of these pupils was 15 years and 6 months their average I. Q. 107. This is considerably higher than the average mental age and I. Q. for the American population as a whole. In the second place, the "A" mental group of these pupils coincided exactly with the "A" group on the Occupational-Intelligence Scale in the number of Alpha points scored. None of the deciles in the higher classes could be so compared with the mental groups on Fryer's Occupational-Intelligence Scale. Thirdly, an intelligence test given to 105 evening high school pupils, all of whom were grammar school graduates, some of them being college graduates, some grammar school teachers, one professional nurse, three machinists, and most of the others time-keepers, bookkeepers, store clerks, and office clerks yielded an average score of 90 points, which is only five points above the average for the 512 high school Freshmen considered in the above tables. Fourthly, the average intelligence of our "D" group (95 points) is about equal to that of adults who had one year of high school training and were tested 15 years later.[10] The average of our "C" group is equal to that of adults who had gone through Junior year in high school and were tested 15 years out of school. The average intelligence of our "B" group is higher than the average intelligence of adults who had been graduated from the high school or who had been college freshmen and were tested 15 years later. With respect to the "E" pupils, investigations have thus far shown that not more than 30 per cent of them succeed in becoming high school seniors.

CONCLUSIONS.

The above study leads to the following conclusions:

First: Only about 46 per cent high school pupils make proper vocational choices—choices that can be realized by them and which they will pursue with maximum satisfaction and efficiency.

Second: About the same number, 47 per cent, make vocational choices that lie considerably beyond their mental reach. Presumably, this proportion of pupils will either not gain their desired vocations or, such as do, will not be entirely efficient in them.

Third: Approximately 7 per cent underrate their ability by choosing vocations that lie considerably below their own mental level.

Fourth: It would seem advisable, therefore, that the first duty of the high school vocational guide or vocational educator should be to acquaint himself with the intelligence of the pupils to whom he would give vocational advice.

Fifth: Viewed from the social standpoint it cannot be said that the American youth is devoid of ambition. He may not always put forth the necessary effort to realize his aim, but, judged by the goal that he sets for himself, he certainly has far reaching desires.

[10]Cobb, Op. cit. Table 8, p. 460.

RELATION OF MENTAL ALERTNESS TEST SCORE TO POSITIONS AND PERMANENCY IN COMPANY

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Three years ago the Bureau of Personnel Research Carnegie Institute of Technology, gave a mental alertness test to a large clerical force. The total results were made practical use of by the firm. The experiment described below is simply a by-product of that investigation but holds, we believe, several points of interest.

From the test scores of the entire clerical group those of a hundred thirty-three individuals working at five distinct jobs, were drawn off for special study. These five jobs were chosen for three reasons. (1) The jobs were all individual jobs, none of them involving supervisory duties. (2) They represented five distinct levels of difficulty of work. (3) A sufficiently large number of individuals were working at each of the five jobs, so that an average would have meaning.

Thirty months later the subsequent history of these one hundred and thirty-three individuals was studied, as regards one fact, were they still on the job? This gave us a perfectly objective criterion.[1]

The data thus obtained was studied with the following questions in mind.

(1) Is there a relation between positions in the company and mental alertness score? (2) Does a natural selection take place with time that makes this relation more evident?

We would expect natural selection to take place in two ways. First by the persons making low scores in the mental alertness test being unable to handle high grade work and leaving and second by persons making high scores in the mental alertness test becoming dissatisfied with low grade work and leaving. That is at the end of two and a half years, we would expect that the average mental alertness score of those remaining in the high grade jobs would be higher than the average of the original group. And that the average score of those remaining in the low grade jobs would be lower than that of the original group. In short, if mental alertness is a prominent factor in clerical work, we would expect the groups to become more distinct when

[1] In this company no definite promotional or rating system had been worked out and promotions or ratings would have been too indefinite a criterion to have been used.

only those persons are considered that remain in the group more than two and a half years.

RESULTS.

The correlation between the mental alertness score and the level of difficulty of work performed by the individual was for the original group +.22, for the group remaining after two and one-half years +.41. That in thirty months raised the correlation 19 points.

In order to study the effect of natural selection in more detail, we have split each grade into three classes: (1) Those scoring above 110; (2) Those scoring between 80-110; (3) Those scoring below 80. The dividing scores chosen are arbitrary but were taken because they seemed from the distribution of cases to be natural breaking points. Interest centers around groups one and three. Group two contains about 25 per cent of the cases and may be considered a neutral group. We have lettered the five jobs from A to E, A being the least difficult job, B being more difficult than A, and less difficult than C, and E being the most difficult job.

The following two tables give the data for (1) the original group and (2) the group remaining after two and one-half years.

ORIGINAL GROUP.

Grade of Work	No. in Grade	Median Score	Per cent scoring over 110	Per cent scoring under 80
A	16	85	26	50
B	15	77.5	20	53
C	24	105	45	33
D	56	103.5	46	30
E	22	118.5	50	13

GROUP REMAINING THIRTY MONTHS.

Grade of Work	No. in Grade	Median Scores	Per cent scoring over 110	Per cent scoring under 80	Per cent turnover for those scoring over 110	Per Cent turnover for those scoring under 80
A	7	67.5	0	57	100	37
B	6	80.0	0	50	100	62
C	11	95.0	27	36	72	50
D	26	111.0	51	23	53	58
E	13	123.0	57	7	41	66

The following points would seem to be noteworthy.

(1) In the original group the median scores of the grades range from 77.5 to 118.5, forty-one points. There are two instances where a lower grade job has a slightly higher median score than the next higher grade job. In the group remaining thirty months the median scores of the grades range from 67.5 to 123.0, 55.5 points. Each grade shows a higher median than the grade below it.

(2) In the two least difficult jobs A and B, no one scoring over 110 has remained. In the C grade a smaller per cent of the remaining than the original group have scores over 110, while for the D and E grade, a larger per cent of the remaining group have scores over 110 than of the original group.

(3) Almost the opposite holds when we consider the group scoring below 80. There is a steady decrease of the per cent scoring below 80 with the rise of the grade of work. There is also with one exception an increase in turnover in this group from A to E.

These results are as a whole confirmed by a study of 330 other cases from the same firm where many jobs were lumped together as being of the same difficulty and the grading was much less carefully done. On account, however, of the inaccuracies that we know entered into the grading, we do not believe the results are worth quoting in detail.

A STUDY OF THE CORRELATION OF COLLEGE STUDENTS' ESTIMATES OF INTELLIGENCE WITH THE OTIS TESTS AND OTHER SCALES

By J. U. Yarbrough

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It is a matter of common observation that college students select certain of their number to designate as superior, bright, and intelligent; and just as frequently do they select others from their group and call them inferior, stupid, and dull. Each student soon after entering college is thus tacitly assigned to his group by his fellow students, and thereafter student conduct toward him is in accordance with this assignment, regardless of the method through which or the circumstances under which the judgment was formed. After observing this practice of more or less unavowed placement by students in some of our largest universities, and finding it to be as common as in our smaller colleges; and too, after observing the certainty with which a group of students act toward a fellow student when once it has placed him intellectually, the writer set about to devise some scheme for testing the accuracy with which college students place their fellows in the scale of intelligence.

In order to make this test the judgments of a group of college students were secured and analyzed. The criteria used by each student in estimating the ability of fellow students were listed in terms of human traits. These traits were used as a basis for rating all members of the class. This final rating of the students by the class was correlated with the rating on the basis of their score on the Otis Test, instructor's estimate, and college grades.

METHOD OF ANALYZING THE STUDENT'S JUDGMENT.

The students used in this experiment were of junior and senior rank. They were in a small compact college where the students were brought together daily in their school routine; where, in fact, the success of the existing system of student self government depended largely upon this close contact. Moreover, they had been associated in this class in psychology for a period of six months and had full opportunity to observe each other in class discussions and work in general. Their work in this class had been in general psychology with no special emphasis placed upon the topic of intelligence.

These thirty students were provided with paper and pencil and without any foreknowledge of the content or purpose of the experiment were asked to answer the two questions given below as the experimenter dictated them:

1. Do you make it a habit to rate one of your fellow students, A, as intelligent and another student, B, as stupid?
2. Enumerate the six human traits which you most frequently use in rating your fellow students.

After question 1 was given and the answers were written on the paper provided, the second question was dictated. The students were told to use all the time they wanted, but to write down the traits as rapidly as they thought of them. Each member of the class was requested to prepare his list without communication with other members. This request was diligently observed. At the end of twelve minutes all students had completed their lists, and were very anxious to report and hear others report. Each student desired to know whether or not his list if six human traits had been partially or wholly reproduced by some other member or members of the class.

Student No. 1 was called upon to place on the board before the class the list of six human traits most frequently used by him in judging the intelligence of his fellow students.

Student No. 2 was asked to add to the list on the board any trait or traits from his list of six which were not mentioned by Student No. 1. Thus we proceeded through the entire class. Should each student use a different list of human traits in forming his judgments, and thereby add six traits to the list on the board, 180 human traits would be enumerated on our master list. But this did not happen. No one could expect this to happen. However, we doubt if many would think that students use so nearly the same criteria in judgment that, of the 180 possibilities only 13 were actually enumerated by the entire class. And under discussion of the class this list of 13 traits was reduced to 6. The 13 traits listed below are given in the same order as they were listed on the board by the students.

1. Quick perception.
2. Adaptability.
3. Leadership in student group.
4. Ability to reason beyond self-interest.
5. Mental alertness.
6. Retention of learning—memory.
7. General appearance and manner.
8. Social poise.
9. Laughter.
10. School grades.
11. Philosophy of life.
12. Originality in thinking.
13. Enjoyment of play.

In the opinion of the class there was overlapping in these characterizations. Therefore, through considerable discussion and definitions we were able, as stated above, to reduce this list to six. These six traits which were to form the students' master scale are given below:

1. Leadership among students.
2. Impersonal reasoning[2]—ability to reason beyond one's own selfish ends.
3. Mental alertness—quickness and ease with which novel material is grasped.
4. Appearance and manner—ability to present one's self to win confidence and respect.
5. School grades: Grades on all college courses.
6. Originality in thinking: Habit of thinking and doing things in an unusual way.

A careful study of the six remaining traits reveals the fact that they, when properly defined, include the 13 former characterizations of the original list: No. 1 is included under No. 3 of the final list; No. 2, under 1 and 3; No. 6, under 5; and Nos. 8, 9, 11, and 13 under 1, 3, and 4. The class was in full agreement in every instance, except in the case of No. 9—laughter. All agreed that "laughter" could be placed under "appearance and manner," yet three students insisted that as a trait for diagnosis of intelligence it is too important to be subordinated in any way.

THE STUDENTS' RANKING OF THE SIX TRAITS SELECTED.

At another meeting of this same class the students were requested to rank these six human traits on the basis of their importance in determining intelligence. Each student was provided with a printed list of the six traits, and asked to follow directions carefully as they were read. "Do exactly what I tell you. Select that one of the six human traits listed here which you think is of greatest value in judging intelligence in a fellow student. Mark this trait 'highest.' Now, select that one of these six traits which you think is of least value in judging the intelligence of your fellow students. Mark this 'lowest.' With this done, select that trait midway between highest and lowest in value and mark it 'middle.' Select that trait now which is of less value than the one marked 'highest' but of greater value than the one marked 'middle.' Mark this trait 'high.' Then select a trait which is not so good as middle but

[2]During the class discussion it was made plain by the students that by "impersonal reasoning" they meant the ability to solve a problem to its conclusion without clouding the issue by the intrusion of the personal element.

better than lowest. Mark this one 'low.' Take the remaining trait of the original six and compare its value with that of each of the other five. Place it between those two which it is most like."

When this ranking had been completed by the class and the results tabulated, the final six traits were arranged in the order of their relative importance in determining the intelligence of a fellow student. Their relative positions are:

1. Mental alertness.
2. Appearance and manner.
3. Originality.
4. Leadership.
5. Impersonal reasoning.
6. School grades.

By accepting these six traits as the criteria for judging intelligence we were able to use this as a master scale for ranking college students.

Some objection may be offered to the acceptance of these traits as criteria for measuring intelligence. It may be urged against some one, perhaps any one, of these traits that there is no relationship between it and intelligence. Question: Are these traits earmarks of intelligence? To what extent these several traits are characteristic of intelligence it is difficult to say. Yet, the following two types of evidence persuaded us to accept them as worthy criteria. First, they represent the consensus of opinion of an average group of college students as to what they think intelligence is. That they had the correct conception of the term "intelligence" we are not arguing. We do think, however, that they had in mind what they call "intelligence," and what they constantly use in placing their fellow students intellectually, and their success in this placement is the aim of this study. The second type of evidence is found in the correlation between these several traits and the results of the Otis Test. When the students were rated on these traits, as is shown further on in this study, and compared with their rank in terms of the Otis Tests the respective value of these traits as characteristics of intelligence is exhibited. The Otis Tests correlate with "mental alertness" .49, with "appearance and manner" .16, with "originality" .48, with "leadership" .24, and with "impersonal reasoning" .38. While "appearance and manner" was considered by the students as the second best characteristic of intelligence, this trait does not seem to be important to success in the Otis Test. There is a reason for this. And it it this reason which causes many people to discountenance intelligence tests

and hark back to the practice of the personal interview. And for the same reason others hold that the intelligence test and the personal interview are mutually supplementary.

CLASS MEMBERS RATED BY MASTER SCALE.

a. By the Students. The class roll in strictly alphabetical order was printed on the left side of a large sheet of paper. Near the top, the middle, and the bottom of the page was printed 'highest,' 'middle,' and 'lowest,' respectively. Midway between 'highest' and 'middle' the word 'high' was printed, and midway between 'lowest' and 'middle' the word 'low' was printed. One such sheet was provided for each of the six traits of the master scale. The class was directed to rate its members in the same way that it rated the six traits of the master scale on the day before. When the class was rated on *mental alertness*, the papers were gathered up. Two days later data were secured in the same way on appearance and manner. This two-day interval was allowed that we might avoid the chance of habitually assigning a man to a certain place on the scale. Only five of the traits were rated by the students, since the college grades were secured from the university records.

By an examination of Table No. 1 several interesting points are observed. 1. In the judgment of the class no one student possessed all five traits in the highest degree. Student No. 11, who makes first place in three traits, is the nearest an exception to this. 2. One may rank high in one trait and low in another. Student No. 8, for example, is given sixth place in mental alertness and twenty-sixth in appearance and manner, and No. 3 ranks second in impersonal reasoning and twenty-seventh in appearance and manner. Students 25, 26, and 27 also indicate the truthfulness of this statement.

This observation is not in line with the "halo" theory as presented by Thorndike. His findings seemed to indicate that those giving the ratings were unable to analyze out these different aspects of a person's nature and rate each independent of the others. "All ratings were effected by a marked tendency to think of the person in general as rather good or rather inferior and to color the judgments of the qualities by this general feeling. A halo of general merit is extended to influence the rating for the special ability, or vice versa."[3] While the data here do not indicate the presence of this tendency generally, yet in some outstanding cases it seems to have been operative.

[3]Thorndike, E. L.: *A Constant Error in Psychological Ratings*, Jour. Appl. Psychl., March, 1920.

TABLE NO. I.

STUDENTS' ESTIMATES OF INTELLIGENCE

Student No.	Mental Alertness	Appearance and Manner	Originality	Leadership	Impersonal Reasoning	Rank
1	23	28	21	30	15	28
2	25	7	14	11	24	15
3	16	27	22	26	2	20
4	18	9	19	13	9	10
5	22	17	30	17	20	25
6	9	13	15	21	6	9
7	19	6	13	8	11	8
8	6	26	16	16	14	12
9	20	5	20	12	16	11
10	12	3	7	6	5	5
11	1	4	1	5	1	1
12	11	1	3	2	7	3
13	14	22	8	19	17	13
14	27	19	10	7	21	16
15	21	20	25	29	19	27
16	10	14	2	1	3	4
17	15	23	26	23	10	21
18	24	10	24	18	30	26
19	8	15	11	10	12	7
20	29	21	29	24	28	30
21	2	12	28	20	25	19
22	28	11	27	26	29	29
23	17	25	23	9	23	22
24	13	30	5	27	26	23
25	3	24	17	14	22	14
26	5	29	16	28	8	17
27	4	16	13	3	13	6
28	7	2	4	4	4	2
29	26	18	9	15	18	18
30	30	8	18	22	27	24

To show more fully the extent to which the several traits correlate with each other the table of intercorrelations is given below.

TABLE NO. II.

INTERCORRELATIONS OF TRAITS.

	Mental Alertness	Appearance and Manner	Originality	Leadership	Impersonal Reasoning
Mental Alertness	.....	.03	.40	.31	.55
Appearance and Manner	.13	.....	.35	.54	.20
Originality	.41	.34	.....	.60	.53
Leadership	.31	.54	.60	.....	.39
Impersonal Reasoning	.55	.20	.53	.39	.....
Average	.32	.28	.47	.46	.42

With this group of students "appearance and manner" is least indicative of mental alertness. In fact, the two traits do not appear to hold together. From Table No. 2 we also note that "originality" shows the highest while "appearance and manner" shows the lowest intercorrelation with these specific traits. Then "originality" would therefore, give us the most information, and "appearance and manner" the least information about this whole group of traits.

b. By the Instructor. Using the same method as the students, the instructor rated the members of the class on each trait of the scale the results are given in Table No. III.

TABLE NO. III.

INSTRUCTOR'S ESTIMATES OF STUDENTS.

Student No.	Mental Alertness	Appearance and Manner	Originality	Leadership	Impersonal Reasoning	Rank
1	27	7	28	21	27	24
2	13	16	17	16	14	14
3	7	17	21	11	9	11
4	29	24	23	20	19	27
5	8	9	15	14	13	9
6	12	4	10	13	12	7
7	23	28	29	25	25	30
8	1	1	7	2	1	1
9	21	18	24	17	20	22
10	9	11	3	12	10	6
11	3	6	2	6	11	3
12	10	3	12	3	5	4
13	16	10	14	5	17	10
14	14	22	20	8	21	16
15	24	12	25	28	22	25
16	6	5	1	1	6	2
17	17	19	16	15	28	20
18	28	8	30	26	29	28
19	4	14	5	10	7	5
20	15	20	26	18	8	17
21	20	13	22	23	18	21
22	22	15	27	24	26	26
23	25	25	19	4	15	18
24	18	23	4	27	30	23
25	5	26	9	22	4	12
26	11	30	18	29	3	19
27	2	21	8	19	2	8
28	19	27	13	7	16	15
29	30	29	11	30	23	29
30	26	2	6	9	24	13

Observations made from Table No. I also apply here. When the rating of a student in one table is compared with that student's rating in the other, this observation is made. Only six students are rated the same on any one trait in both tables. Of these, four are on leadership. They are Nos. 11, 14, 17, and 25. This agreement, though slight as it seems, selects the highest ranked leader and almost the lowest.

The intercorrelations of the traits as presented by the instructor's estimates are shown in Table No. IV.

TABLE NO. IV.

INTERCORRELATIONS OF TRAITS.

	Mental Alertness	Appearance and Manner	Originality	Leadership	Impersonal Reasoning
Mental Alertness	.....	.29	.85	.49	.80
Appearance and Manner	.29	.....	.25	.48	.14
Originality	.85	.25	.....	.70	.45
Leadership	.49	.48	.70	.....	.43
Impersonal Reasoning	.80	.14	.45	.43	.....
Total	.61	.29	.56	.51	.46

"Mental Alertness" shows the highest intercorrelation of all the traits with "originality," the students' most significant trait, taking second place. "Appearance and manner" continues to be the lease significant of all the traits.

CORRELATION OF STUDENTS' ESTIMATES OF INTELLIGENCE WITH STANDARD SCALES.

In order to test the value of students' estimates of the intelligence of fellow students by means of these traits, we have brought together in Table V the results of Tables I and III and the students' ranking in both college grades and the Otis Intelligence Test.

In column No. 1 the students are ranked by the class on the basis of the six traits in Table I. Column No. 2 contains the ranking of the same students by the instructor on the basis of these same six traits. In column No. 3 the students are ranked according to their grades in the office of the University. The ranking of the students on the Otis Group Intelligence tests is presented in column No. 4. Their scores were made on the "Advanced Examination: Form A. Edition 1921."

The instructor's estimate and college grades are combined for the ranking given in column No. 5. This is done to get a

comparison of this combined rating with the results on the Otis Test. Before attempting to compare the estimate made by the students to any of these standards, I think it wise first to determine the value of the instructor's estimate, the college grades, and the Otis Intelligence tests in relation to each other. Since the Otis test is generally accepted as a standard measure of intelligence, I will evaluate the others in terms of it. By comparing column 2 with column 4, one secures a correlation of .46, between the instructor's estimate and the Otis Test. In the same way the relation between college grades and the results on the Otis test is found by comparing columns 3 and 4. This correlation is .53. By a comparison of the rankings in columns 2 and 3 the correlation between instructor's estimate and college grades is found to be .41. The instructor's estimate and college grades are often combined in judging intelligence. Their combined value when compared with the Otis test is found by comparing columns 4 and 5. The correlation is .57. When combined in this way they give a higher correlation with the Otis test than either one when taken alone. These correlations are "markedly present," yet not too high. However, since both instructor's estimate and college grades are in such common use I am using them as standards along with the Otis Intelligence Test.

These three standards are significant because of the fact that they are of different types. The Otis Test is a theoretical attempt to build a scale of measurement. Its further value lies in the fact that its scores check favorably with scores made on other tests which are equally sound in theory. The instructor's estimate is an entirely different kind of standard. It is an individual judgment, while the students' estimates form a composite judgment. Theoretically this last should be the proper basis for judging, for after all this is the final criterion in the business world. It is the composite judgment of one's fellows that places one at a particular level. Hollingworth finds that group judgment is more accurate than the judgment of the individual. "The individual judges intelligence with a correctness of only .19 on the average; the group judges intelligence with an average correctness of .51."[1]

a. Instructor's estimate. By a comparison of columns 1 and 2 of Table V one is able to determine the relationship between the students' estimate of intelligence and that of the instructor. This relation, expressed by means of correlation is .61. This is a rather high correlation and would seem to justify the conclusion that the summation of the opinion of students with the maturity and college rank of this class is as good a measure of intelligence as their instructor's judgment.

TABLE NO. V.

ESTIMATES AND STANDARD SCALES.

Student Number	Students' Estimates	Instructor's Estimates	College Grades	Otis Tests	Inst. Estimate and College Grades
1	28	24	22	20	26
2	15	14	30	14	25
3	20	11	8	10	7
4	10	28	9	4	17
5	25	9	7	27	5
6	9	7	16	12	11
7	8	30	27	24	30
8	12	1	3	1	1
9	11	22	25	29	27
10	5	6	15	17	9
11	1	3	1	2	2
12	3	4	5	16	3
13	13	10	17	23	13
14	16	16	26	18	23
15	27	25	28	30	29
16	4	2	29	6	14
17	21	20	18	21	20
18	26	28	13	22	21
19	7	5	4	3	4
20	30	17	20	28	18
21	19	21	21	19	22
22	29	26	24	26	28
23	22	18	19	15	19
24	23	23	10	8	15
25	14	12	6	13	6
26	17	19	2	7	10
27	6	8	11	5	8
28	2	15	12	25	12
29	18	29	14	9	24
30	24	13	23	11	16

b. College grades. When the rating of the members of the class made by the students and found in column 1 is compared with the results based on college grades and given in column 3, the correlation is found to be .34. This is in keeping with the student judgment, for when building their scale they placed college grades as the poorest of the six traits for measuring intelligence. One must not confuse the student's ability to make college grades with what he actually does. These students are ranked on the grades

'Hollingsworth: *Judging Human Character*' page 41. Similar findings are reported in other chapters of this book.

they have actually made. We cannot say how nearly they approach the best of their several abilities.

c. Otis Intelligence Tests. As a final measure of the students' estimates of intelligence the students are ranked according to their success in the Otis Intelligence Tests. The range of their scores on this test was from 125 to 203. The correlation of the two rankings thus given in columns 1 and 4 in Table V is .51. Students estimates of intelligence compare very favorably with the results of the Otis Test, slightly better, in fact, than other investigators have found college grades to relate to intelligence. Pressey obtained a correlation of .48 between intelligence and school marks.[5] Terman found a correlation of .45 between school marks and mental age.[6] Book reports the coefficient of correlation for high school seniors between school marks and intelligence to be .47.[7] If, therefore, we take the Otis Intelligence Test as a standard the consensus of student opinion must be highly respected as a measure of intelligence.

SUMMARY.

1. Correlation Summary:

	Students' Estimates	Instructors' Estimates	College Grades	Otis Tests	Col. Grades & Inst. Estimates
Students' Estimates	.....	.61	.34	.51	.48
Instructor's Estimates	.61	.....	.41	.46	.82
College Grades	.34	.41	.....	.53	.83
Otis Tests	.51	.46	.53	.....	.57
Col. Grades and Inst. Est.	.48	.82	.83	.57	.....
Average	.49	.59	.52	.52	.67

2. If the instructor's estimate is an accepted standard, the consensus of student opinion, gained under the conditions of our experiment, is a better measure of intelligence than college grades or the Otis Tests.

3. If the college grades are taken as the accepted standard the students' estimates are not so good a measure of intelligence as either the instructors' estimates or the Otis Tests.

4. Accepting the Otis Tests as a standard, the students' estimates are practically as good a measure as either the instrustors' estimates or the college grades. If, however, the instructors' estimates and college grades are combined, they give a slightly better measure.

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[5]Pressey, S. L.: *The Efficiency of the Group Point Scale in Prognosticating Success and Failures in Junior High School.* Jour. of Applied Psychology, 3:381-385.

[6]Terman, L. M.: *The Intelligence of School Children,* 1919, page 79.

[7]Book, W. F.: *The Intelligence of High School Seniors,* 1922, page 105.

A SCHEME FOR COMBINING INCOMPLETE RANKINGS

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School marks are usually assigned to several groups of students in terms of letters. The number of groups ranges from three to seven. When these marks are to be combined in such a way to get the student's average standing, the task is found perplexing and often ambiguous. Sometimes percentage values are assigned to each letter and these values averaged. In other cases point value as 5, 4, 3, 2, 1 and 0 are assigned to the letters A, B, C, D, E, and F respectively and the average found. Both of these methods often give very unsatisfactory results. The principal cause for this is the variation in the absolute marks assigned by different instructors. In some classes where there is no reason to infer that the selection has been great, a large per cent of the class receives high grades and at the same time in other classes the low grades are more numerous. In order that the work for the semester or term may be averaged in a satisfactory manner, it is desirable to find some scheme that will partially eliminate this wide variation in teachers' judgments.

Teachers agree much more closely in ranking a group of students or a bunch of examination papers than they do in assigning absolute grades in terms of letters or percentages. Usually there is no difficulty in ranking the best and the poorest fourth of the class. It is not usually difficult to rank a class of thirty with considerable accuracy. The smaller the class the easier the task unless the process of selection has been very great. Even then, if vigorous work is required and the tests are made difficult enough, individual differences are revealed.

That instructors do vary greatly in their marks does not need further proof to those who have had experience with teachers' grades. That rankings made by different teachers are less variable and consequently much more reliable may not be accepted so readily. Meyer published the distribution of marks assigned by forty professors at the University of Missouri to their students in a period of five years. These distributions show that the per cent of A's assigned ranges from 1 to 55. Similar tabulations have been published for Harvard University, University of Wisconsin, and Cornell University [1]. All these tabulations furnish evidence of the wide variation in marking. Starch presents fur-

[1]Starch, Daniel: *Educational Psychology*; 1920, 426-31.

ther evidence to show that the variation among teachers in marking the same paper is just as great. When school work in two subjects like arithmetic and language, however, is correlated, a marked or high correlation is usually obtained [2]. This is evidence that, although the teachers have varied greatly in the specific marks assigned, they have not varied so much in the order of ranking.

If we admit that ranks are more accurate than the traditional school marks, are we any nearer the solution of our problem? How are we to combine these ranks? No instructor will rank all the students in any one class. How shall we weight a rank of 1 in a class of 5 and the same rank in a class of 35? Certainly they should not have equal weight.

The first investigation that attempted to solve this problem, as far as the writer knows, was by Professor E. L. Thorndike [3]. Recently other investigations have appeared. Important among these is the one by M. J. Ream [4]. Ream's method is only a modification of the one set forth earlier by Thorndike, but certainly is better in being more accurate and less laborious. The scheme here presented is only a modification of that suggested by Ream. It is better for two reasons. First, it eliminates negative signs and decimal fractions, both of which are likely to cause errors, to say nothing of the extra time and care. Second, the units are expressed in percentiles instead of in standard deviations. The former has more meaning to the average person. It is, of course, true that they amount to the same thing.

It is assumed that all distributions are normal and that any skewness is due to the teacher's inaccuracy in grading or marking. This assumption is not absolutely true, but it is much truer than to assume the distributions obtained from the teachers' grades correct. In the writer's opinion, to throw a distribution into percentiles and thus give it the form of the normal frequency curve corrects many errors of judgment on the part of the teacher. It will have to be admitted, however, that it introduces some errors as well as retains some of those already there. This is especially true when the group being considered is highly selected.

A concrete example of how the percentiles are found for a class of six will make the procedure clear. First, the numbers 1, 2, and 3 are divided by 6, the number in the class. This gives 17,

[2]Starch, Daniel: *Educational Psychology;* 1920, 54-57

[3]Thorndike, E. L.: *The Technique of Combining Incomplete Judgments of the Relative Position on n Facts Made by n Judges.* Journal of Philosophy, Psychology and Scientific Methods, 1916, 13, 197-204.

[4]Ream, M. J.: *A Statistical Method for Incomplete Order of Merit Ratings.* The Journal of Applied Psychology, 1921, 5, 261-66.

33 and 50. Second, from Thorndike's Mental and Social Measurements, Table 54, the numbers corresponding to 17, 33 and 50 are 1.49, .68 and .22 respectively. Third, 3 is added to each of these numbers to give the distance in terms of the standard deviation from the lower end of the distribution instead of from the middle. Fourth, each of the three sums is divided by 6, the length of the distribution in terms of the standard deviation. The quotients, 75, 61 and 54 are the percentiles. The scores for the lower half of the group may be found by inspection since the distribution is assumed to be symmetrical.

Method of application. Now suppose we wish to find the average score of an individual. Let us take an actual case, that of student X. He ranks

1 in a class of 6
1 in a class of 42
2 in a class of 18
2 in a class of 22
13 in a class of 40

By consulting the tables, we find the corresponding percentiles to be 75, 91, 73, 75, and 58 respectively. The average of these is 74.4. In a like manner the average may be found for all other students.

At the University of New Mexico, each instructor is requested to rank the upper half of his classes and include these rankings in his final semester report. For the semester ending January 28, 1922, the writer asked each instructor to rank the lower as well as the upper half of the class. Two exceptions were made. The instructor of history was not able to have charge of his classes the last month. They were taught by substitutes and for this reason are not included. The other exception was music, which probably depends more upon special ability than upon general intelligence.

After all the data were assembled, the average for each student was found in a manner similar to that used in the illustration above. All subjects that were not ranked as many as three times were discarded. No attempt was made to separate the college classes. If freshmen and seniors happened to be in the same class, they were ranked without respect to classification. No distinction was made for classes meeting two, three, four, or five times a week. This could have been done, but seems foreign to the problem.

During the semester the writer gave the Alpha tests to 148 students in the University. A few of these dropped out before the end of the semester. Altogether there were 138 who had scores in scholastic achievement and in the Alpha tests. The 138 students were assigned percentile ranks in each trait. These were assigned in such a way as to make the distribution take the form of the normal probability curve.

As a check on this method of finding scholastic scores, the following values were assigned to the several letters and the student's average grade found:

A=94%	D=74%
B=88%	E=67%
C=81%	F=50%

After these averages were found, the 138 students were assigned percentiles so as to give the distribution the form of the normal probability curve. Three correlations (by the product-moment method) were now obtained: first, between intelligence tests and the scholastic standing determined wholly from the ranks; second, between the intelligence tests and the scholastic standing determined by assiging absolute values to the letters indicating the grades; and third, between the scholastic standings determined by the two methods indicated above. The three correlations are repectively, as follows;

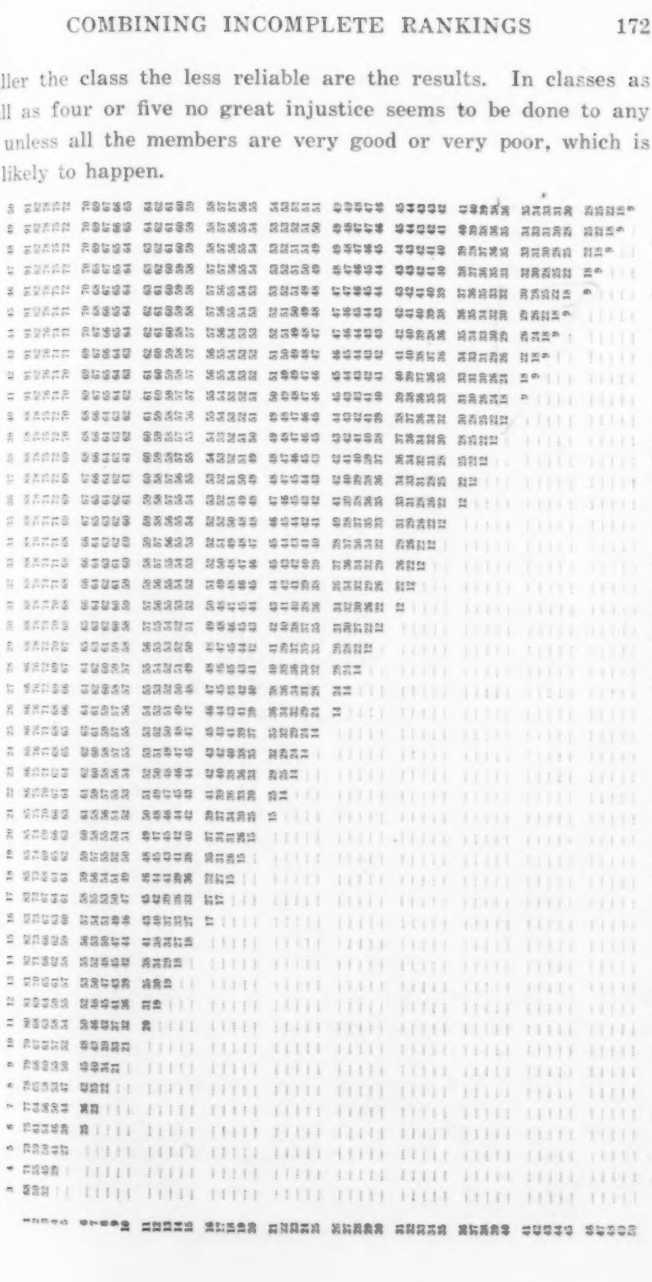
$$r_1 = .40$$
$$r_2 = .35$$
$$r_3 = .78$$

The method of disregarding absolute grades and using only the ranks, then, gives a more reliable result judged from the intelligence tests as a criterion. The difference between the two methods is small, yet it is sufficient to be significant when this number of subjects is used. The two scholastic rankings have a high correlation, yet it is far from perfect.

Great scientific accuracy is not claimed for the scheme here set forth. It is as accurate as any now in use and has the advantage of being very simple and easy to manipulate. The

smaller the class the less reliable are the results. In classes as small as four or five no great injustice seems to be done to any one unless all the members are very good or very poor, which is not likely to happen.

TABLE I.



Showing percentile scores as determined by the number in the class and the rank in that class. Numbers at the top of each column indicate the number in the class and numbers in the column at the left indicate the ranks.

THE BASIS OF TOOTH PASTE SALES IN REPRESENTATIVE COMMUNITIES

By Donald A. Laird.

I. INTRODUCTION

This is a report of a fairly extensive survey which was made of two distinct communities with reference to the use and the sales of tooth pastes and similar preparations. The survey was made by a class in the psychology of advertising as a term project. It was conducted in Laramie, Wyoming, a town of about seven thousand inhabitants. The population is composed in the main of retired ranchers, business and professional families, and the families of workers in the refinery, plaster mills, Union Pacific division employees, and a scattering of students.

It was not attempted to cover the entire town. Rather the aim was to select as rigorously as possible certain sections which represented unequivocally sociological extremes typical of the Main Street town. One section of the town was chosen for study because it represented the *elite*, contained the residences of the better classes, business and professional men, university families, and a scattering of well to do ranchers who manage their land affairs from the town. This section was purposely kept small in order to be certain that the families who contributed information for this group were without doubt properly labelled. In a small town there is little difficulty in so classifying the townspeople.

Opposed to this section, the *creme de la creme* of Laramie, a section was mapped out which contained the colored section of the population, a majority of the foreign element, and the unskilled workers in general. This section is commonly referred to as the *West Side*. In this report the two groups will be designated the Elite and the West Side.

II. THE SURVEY.

A house to house canvas was made of the two carefully selected districts. For each house information was gathered under the following beads:

1. Street and number
2. Persons in family (excluding roomers)
3. Brand of paste used
4. Why used (flavor, dentist's advice, samples, advertising, friends, etc.)
5. How many tubes used a month
6. How many in family use paste once daily

7. Any other brands used in family
8. Why others are used

The canvasers were instructed to pass by any homes which seemed by outward appearances not to properly belong in the district being surveyed.

The students were divided into two equal groups, one for each section. A student was selected from out of each group to serve as section captain in taking charge of the details of the survey.[1] Several students not in the class requested an opportunity to take part in the data gathering. The only canvaser to be thrown out of a house was one of these volunteer solicitors who was ejected bodily, even though the door-mat read "Welcome!"

III. RESULTS.[2]

A total of 228 families were interviewed, 104 of which were from the Elite district. This report is based, however, upon only 148 families. Some were eliminated due to grossly incomplete data, some others were also eliminated from the Elite returns because of bad ratings in the local credit bureau. Eighty-one of the families to be reported were from the West Side.

Table I gives the distribution of the families arranged by number in the family.

TABLE I.

DISTRIBUTION OF SIZE OF FAMILY IN THE TWO DISTRICTS

	Frequency	
Number in family	Elite	West Side
1	0	1
2	18	19
3	18	16
4	12	14
5	14	14
6	1	9
7	2	3
8	1	3
9	1	0
10	0	1
11	0	1

The medium size with the Elite group falls in the 3 interval, with the other group the medium falls in the 4 interval. The arithmetical mean for the Elite family size is 3.6, on the West Side it is 4.1.

In 67 families in the Elite section there are 54 that make use

[1] Section captains were Mr. Robert Johnson and Mr. Harry Engstrom.
[2] Tabulated with the assistance of Mr. Ralph Holtsma and Mr. Willard Brokaw.

of a toothpaste, at least one member of the family uses it. In the other section there are 53 families out of the 81 in which at least one member uses tooth paste. On a per cent basis this is 80.6 per cent of the Elite families and 65.4 of the West Side families in which tooth paste is used.

It was difficult for many of those interviewed to conscientiously state, in reply to item 5, how many tubes were used a month in the family. In the Elite section there were only 20 families in which this reply was recorded. In the other district 45 families replied. These families represent 77 individuals in the Elite district and 194 individuals from the West Side. The twenty families from the Elite group report the use of 37 tubes (full size) a month. This is an average consumption of 0.48 tube a month per individual. It must be borne in mind that this is per individual for whom we have data available. If this included all the families it is quite probable that there would be a zero after the decimal point. The West Side families reported the consumption of 84 1-3 tubes per month. On an individual basis this is 0.43 tube per individual per month among those who reported.

These results are somewhat in contrast. Among all the families interviewed we have found that a considerably larger per cent from the Elite district use a dentrifice. But when this comparison is reduced to a comparison of amount used by those that do use a dentrifice then the two groups practically coincide.

Of most interest from the point of view of advertising is *why* the users use the particular brand that they do. Admittedly in many instances the replies to item 4 were rather forced, for they had never given the matter much consideration. Rationalizations in forced explanations were undoubtedly very conspicuous. But at that the reasons attributed by the users for their use are a revelation. Especially when checked up with the chief overt advertising appeals that are in vogue in the marketing of these preparations.

Table II gives a detailed tabulation of the responses to item 4. It should perhaps be noted in passing that before the solicitors went out into the field they were gathered together and instructed regarding the data to be collected. They were especially warned against suggesting any response other than what might be the natural one. In the case of item 4 the suggestions in parentheses were arrived at after the group making the survey had tabulated their own reasons for using their particular brand of dentrifice. In case it was necessary to give suggestions to the person being being interviewed they were instructed to read the entire list of suggestions before letting the subject respond.

TABLE II.

REASONS GIVEN FOR THE USE OF DENTRIFICE, BY BRAND AND SECTION

Brand	Elite Section								West Section							
	Totals	No Reason	Flavor	Easy to Get	Advertising	Recommended by Friends	Advice of Dentist	Cheap	Totals	No Reason	Flavor	Advertising	Recommended by Friends	Advice of Dentist	Samples	Cheap
Colgates	19	7	8	1	1	1	1	0	28	9	12	3	0	0	2	2
Pepsodent	16	6	7	0	1	0	2	0	13	7	3	2	0	0	1	0
Pebeco	0	0	0	0	1	0	0	1	0	2	1	2	0	4	0	6
Kolynos	3	0	1	0	0	0	2	0	4	1	0	1	1	1	0	0
Chamberlain's	1	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0
Chlorax	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Dr. Grave's	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Listerine	1	0	0	0	0	0	1	0	1	0	1	0	0	0	0	0
Soda or salt	3	0	0	0	0	0	3	0	1	1	0	0	0	0	0	0
Dr. Lyon's	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	1
Nyal	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0
Totals		13	20	1	4	2	13	1		21	17	7	1	1	3	3

A comparison of the totals columns shows the difference between the two communities in the matter of paste used. The preponderence of Pepsodent and Pebeco in the Elite section is worth mentioning in passing. There are other interesting but minor differences in the choice of a dentrifice between the two groups.

When the reasons given for the use of the particular brand are examined group differences also appear. The largest difference under this head is in the advice of the dentists. This appeared 13 times in the Elite section, and 1 time in the other section. Samples, which had been given the children in school, was given as the reason for the start of the use of a particular brand in three homes of the West Side, and not once in the other section.

The predominant reason for the use of personal brands was that of the flavor of the preparation. Neglecting the no reason responses this reason of the flavor being liked has a greater frequency than all of the others combined. The ratio of 47:29 between the use of Colgates and Pepsodent can largely be explained on the basis of flavor. Even in the Elite section where one would expect to find the consumers influenced by scientific appeals in advertising we still find flavor predominating over dental advice and advertising in the reasons given from this group.

Undoubtedly the manufacturers are well aware of the importance of flavor in a dentrifice. Their advertising, however, almost without exception is directed toward certain scientific sounding appeals for the use of their product. When one gets down to the reasons given for the use of any particular brand, the scientific reason is not mentioned a single time. Undoubtedly it is the advertising, based upon the opinions of high dental authorities, that has established the rigorous tooth paste habit of Mr. Average Citizen, whether he lives on the West Side or on Easy Street. Flavor on the other hand, seems to be the principle determining reason for the use of any particular brand.

IV. SUMMARY.

A house to house survey was made of the two distinct districts by the students in a class in the psychology of advertising. A good and poor residential district was covered. The tooth paste habits of the inhabitants was enquired into. It was found:

1. This is an excellent method of instilling the spirit of scientific psychological approach to the problems of advertising;

2. About 80 per cent of the families from the better section and 65 per cent from the poorer section make some regular use of a dentrifice;

3. On the basis of individual consumption, there is no significant difference between the sections among those *that do use* a dentrifice. In other words, when the tooth paste habit once hits, it hits with equal force in both districts;

4. But, the tooth paste habit does not occur with as great frequency in the poorer district as in the better class district;

5. Dentist's advice plays but a very minor role in the use of dentrifices in the poorer districts;

6. In both districts the predominating reason for the use of *any particular brand* is determined largely by the flavor;

7. School samples play no apparent part in the use of a paste in the better districts, they do play some part in the poorer district.

VOCATIONAL TESTS FOR AGRICULTURAL ENGINEERS

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INTRODUCTION

The following is a contribution to the development of vocational norms which are essential for scientific vocational guidance and selection. It presents nothing particularly novel in the way of technique but gives data for a vocation that has not hitherto been studied in this manner.

It is obvious in the university as well as subsequently that some men who undertake agricultural engineering as a vocation lack the requisite ability. Hence the problem of vocational prediction is in point. Moreover this vocation requires more than mere intelligence. Observation and analysis makes it clear that it is to quite an extent a question of special ability. So an effort was made to devise special mental tests for predicting this ability and to standardize them on advanced students in agricultural engineering.

METHOD

The selection of the tests was based on some preliminary experiments the previous year as well as upon further analysis of the mental factors involved in the vocation. Typical of such factors are motor coordination involved in the use of surveying and drawing instruments, various aspects of attention involved in testing farm machinery and taking readings at the proper moment, spatial perception and imagination involved in planning farm buildings with reference to their contents, and observation and judgment involved in planning topographical layout or drains. While no mental test measures any such factors exclusively, an effort to approach such measurement is far better than random selection of test material. Some of the tests employed were modifications of those used by various investigators and some were devised especially for the occasion. Those which proved useful and were retained in the final norms will be described below.

The tests were given, with two exceptions, by means of mimeographed blanks. All the blanks were clipped together in a folder. The group method was used and each test had a time limit such that no subject would quite finish it. Each test comprised two installments,—on successive pages or on the same page separated by a space and the word "stop," according to the amount of material. At one sitting the first installments of all the tests were

given in succession. The following day the second installment was given in the same order. It was thus possible to locate cases where the subject misunderstood or made a bad start and also (if desirable) to correct for attenuation. The order of the tests was designed to avoid undue fatigue by interspersing tests requiring close concentration and effort with those somewhat less exacting. There were 14 tests used but as several were scored in more than one manner, there were 18 different independent variables involved in the research.

The directions were given orally. The first page of the folder contained examples of various tests and after finishing one test the subject marked the place in the folder with the finger and turned back to the example page during the explanation of the next. The examples were in most cases designed to allow one or two items for practice. The directions were, of course, standard and given verbatim but were abbreviated somewhat for the second installments.

The subjects were 43 advanced students specializing in agricultural engineering at Ohio State University. They were tested in two groups during the winter of 1921-22. They were directed to take the examination by the dean of their college so it is safe to assume that incentive was sufficiently near a maximum to be constant. The testing was done personally by one of the writers (Burtt). The total time for the tests, including directions was a trifle over two hours, i. e. one hour at each sitting.

The criterion for evaluating the tests consisted of ratings as to "ability in agricultural engineering" made by three instructors in the department. Ratings were used rather than grades in engineering studies on the theory that the latter are less apt to reflect a man's actual ability.

The ratings were made on a linear scale of the sort commonly used. The names were typed in a column at the left of the page followed by five ruled columns of uniform width. These columns were headed from left to right "lowest fifth", "next lowest fifth" etc., and represented the distribution, on the basis of ability, of all the persons pursuing this vocation whom the judge new. A cross was to be placed after each name indicating the student's ability with reference to this whole distribution and the greater the ability the farther to the right the cross was to be placed. A preliminary statement at the top of the blank explained this method in detail. The ratings were then measured in millimeters from the left edge of the left column, thus expressing the judgment quantitatively.

The instructors made their ratings independently. The raw figures could not be validly averaged for a given subject because

the judges might differ in the central tendency and scatter of their ratings. Consequently each judge's estimates were converted into the form x divided by *sigma*, i. e. the deviation of the measure in question from the mean of that judge's ratings taken in terms of the standard deviation of his ratings. With such converted measures the three judges' estimates for a given subject could then be averaged to get a combined rating (the criterion). Most of the subjects were rated by all three judges but in the case of three subjects only one rating was available.

The next step was the final selection of the tests. The scores for the two installments of each test were added together to form a single score which was used throughout. Correlation scatter plots were then made for each test against the criterion. It was found convenient to plot several pairs of variables simultaneously, keeping the criterion on the ordinate, aligning the blanks, placing a long ruler below the desired row and checking in the proper column on each blank for the other variables. Those plots which showed by inspection any semblance of correlation were computed by the "products-moments" formula. Eight of these were retained as showing some promise (the highest coefficient being .47) and intercorrelated and the regression equation derived.

DESCRIPTION OF TESTS

Only the seven tests which appeared in the final regression equation will be described. There were eight tests in the equation but the weighing of one of these proved to be zero. They are numbered as they were in the equation but these numbers have no ulterior significance.

Test 2 consisted of a series of small circles (letter "o" on a typewriter) in two columns 2½ inches apart. Those in each column were double spaced on the typewriter with the right column a single space below the left. They were numbered alternately in the two columns, i. e. odd numbers in the left and even numbers in the right. The subject connected the circles in the numbered order, i. e. drew straight lines from side to side, gradually moving down the page. He kept time with a metronome set at 120, i. e. made a stroke to the right and back again in a second. There were 56 circles in the column. The subjects were stopped immediately at the moment they should have finished so that if they did not keep with the metronome their blank was incomplete. There were two series of this sort on a blank. One was done as above described but for the second the page was turned 90 degrees so that the strokes were up and down. One such page constituted an installment of the test. The instructions were to stop as near as possible to the center of each circle but to keep

time with the metronome. For scoring, a transparent stencil was made with a ¼ inch circle concentric with each "o". All strokes the end of which fell within this circle counted one point. This penalized those who did not follow the metronome to the extent of one point for each stroke they failed to make. The maximum score was 224.

Test 3 had at the top of the page a large diagram of a triangle, circle and rectangle overlapping in such a manner that there were areas comprising all three figures, each combination of two of them and each alone. In each of these areas were several symbols, —vowels, consonants and digits. The following are typical of items which appeared below the diagram:

1. Vowel that is in triangle but not in circle or rectangle ( )
2. Smallest number in circle and rectangle but not in triangle ( )
3. Consonant that is in rectangle circle and triangle ( )

There were 14 such items in each installment. The instructions were to place in the brackets at the end of each line the letter or number called for by the specifications in that line. The time limit was 2 minutes for each installment. The score was the number of items correct with a maximum score of 28 for the total test.

Test 4 was Thurstone's "Special Relations B" given in one installment only with a 4 minute time limit. The subject was given ample time to read the printed directions attached before turning to the test. The score was the number of items correct minus the number wrong. The maximum score was 39.

Test 5 comprised lines of digits in apparently random order,—65 digits to the line.[1] The test consisted in crossing out 2 and ringing 3 until coming to a 7 and then reversing the process,—crossing 3 and ringing 2,—until the next 7 etc. It was arranged, however, so that the first reaction after a 7 was always a "cross out." The subject knew this so if he became "lost" it was necessary to go back merely to the last 7. There were five crucial numbers between each pair of 7's and three such units per line. One unit comprised three 2's and two 3's and the next unit two 2's and three 3's etc. There were six lines in an installment and the time limit was 1 minute and 45 seconds. The subject was given one point for each correct mark. Furthermore in case several items in a unit were marked the opposite of what they should be and the subject had manifestly started the unit wrongly and reacted thereafter accordingly, he was given credit for the symbols thus marked but penalized one point for the initial mistake. The maximum total score was 180.

[1] A test similar to this has been used by H. A. Toops, but as far as the writers are aware has not been published.

Test 6 was auditory memory by the method of word pairs with logical material. There were three types of word pairs used: one type was normal, another comprised words related to agricultural engineering and a third involved pairs dealing with zeal, industry, interest in one's work etc. These three types rotated in succession through the list. The following is typical of a sequence of such pairs:

1	letter	stamp
2	formula	equation
3	task	eager
4	diamond	spade
5	liquid	hydrometer
6	strive	attain
7	spider	spin
8	engine	windmill
9	work	pleasure

There were 27 pairs in a series,—9 of each type. Two such series constituted an installment. The instructions were to listen while the 27 pairs were read and try to notice the natural connection between the two words. A metronome, somewhat muffled, sounded one beat a second as a guide for the experimenter. The two words read on two successive beats and there was a pause during the third beat. The first word of the next pair came on the fourth beat. The subject's blank consisted of a series of numbered lines. Immediately after the initial reading of the list by the experimenter, the first words of each pair were read with the appropriate number, e. g. "I letter, 2 formula" etc. The subject wrote after the appropriate number the word that had paired with the one in question. Five seconds were allowed for each response. The score was the number of words correctly recalled. However the three types of pairs were evaluated separately. Especial interest attached to the total number of words of the agricultural engineering type recalled as compared with the total number of normal words recalled. The ratio of the former to the latter was the score used in the regression equation. The ratio was multiplied by 100 to simplify computation.

Test 8 was an "information" test comprising items related to agricultural engineering. Effort was made to select items that would not actually be discussed in the class room but with which an alert interested student who read current agricultural engineering literature would be familiar. Technical journals were used considerably in devising such items. The following are typical:

1. A track laying tractor is used for: ROAD ROLLING: PAINTING: MILKING: LAYING TRACKS: PLOUGHING.

2. The best blower belts are made of: LEATHER: RUBBER: JUTE: SILK: HEMP.

3. Soil stack is a term used in: BOILER FITTING: SURVEYING: CEMENT MANUFACTURE: PLUMBING: SOIL ANALYSIS.

There were 20 such items in each installment. The subject was instructed to underline the one of the five alternatives in capitals that belonged in the sentence. The time limit was 2 minutes per installment. The score was the number of items correctly marked and the maximum total score was thus 40.

Test 9 was a modification of Thurstone's directions test. Parts I and II had the following directions:

If the word contains E, A, and R mark it 1
If the word contains E but not A and R mark it 2
If the word contains A but not E and R mark it 3
If the word contains R but not E and A mark it 4

Parts III and IV had the following directions:

If the word contains I, N and G mark it 1
If the word contains I and N but not G mark it 2
If the word contains I and G but not N mark it 3
If the word contains N and G but not I mark it 4
If the word contains I but not N and G mark it 5

Each part consisted of 40 words of from 5 to 11 letters selected so as to belong to one of the classes indicated. They were arranged in 5 columns and each word was followed by a short dotted line for recording the answer. There were always an equal number of words requiring each sort of response in the "part". The subject was instructed to read the directions, look at the samples and mark the words in the same way. Parts I and III were done in successsion with time limits of 2 and 2½ minutes respectively and constituted the first installment. Parts II and IV were given likewise as the second installment. The score was the number correct and the maximum score 160.

RESULTS

The regression equation is as follows:

$$X_1 = .0021X_2 + .0195X_3 + .0091X_4 + .0133X_5 + .0128X_6 + .0070X_8 - .0014X_9 - 3.1892$$

Where X1 is the combined vocational score and X2—X9 the raw scores in the various tests above described. The weighting of *Test 7* proved to be zero. The coefficient of multiple correlation

$R_{1\ (23456789)}$ of the weighted sum of test scores and the criterion may be computed theoretically from the partial coefficients and proves to be .60. By actually weighting the original scores and correlating with the criterion the coefficient is .62±.07.

The extent to which the various tests contribute to the final weighted score may be seen from the following table which gives for each test the correlation with the criterion of zero order, e. g. r_{15}, and also of the seventh order with all the other tests constant, e. g. $r_{12\cdot3456789}$.

Test	Zero order	Seventh order
2	.24	.10
3	.34	.11
4	.26	.13
5	.47	.35
6	.42	.30
7	.39	.00
8	.27	.05
9	.28	—.05

Tests 5 and 6 apparently carry most of the load. They have the highest coefficients of zero order and also the highest when the other tests are constant. *Test 7*, on the other hand, while being fairly good of itself merely duplicates factors involved in the other tests as shown by the partial coefficient of zero.

The correlation between *tests 5 and 6* is only .15. A regression equation was derived using only these two tests and is as follows: $X_1 = .0126X_5 + .0157X_6 - 2.64$.

The coefficient of multiple correlation $R_1(56)$ is theoretically .59 and the same result is obtained by weighting the original test scores. Moreover the weighted sum of *tests 5* and *6* correlates with the weighted sum of *tests* 2—9 to the extent of .92. So it is obvious that the two tests will give almost as reliable a prediction as the seven.

The technique of partial correlation involves, of course, the assumption of linearity of the original regressions. These regressions were not computed to test this assumption. However for the two final multiple correlations of criterion with weighted sum of tests the correlation ratio *(eta)* was computed. In the case of the weighted sum of the seven *eta* for x on y (y being the criterion) is .76, while r as above mentioned is .62. Blakeman's[2] criterion of linearity (using his simplest formula) is 2.1. Theoretically if this is less than 2.5 the regression may be considered linear. In the case of the weighted sum of the two tests *eta* is .74 and Blakemans's criterion is 2.2.

[2]Blakeman, J.: On Tests for Linearity of Regression in Frequency Distributions. *Biometrika*, 4, 332-350.

That the ability in question does not consist of mere intelligence but is definitely specialized is evident from the following. All the subjects had, on another occasion, taken the University Intelligence Test—a somewhat modified army alpha. Scores in this test correlate with the criterion to the extent of only .16±.10, whereas the corresponding correlations for some of the special ability tests are between .40 and .50 and for their weighted sum is about .60. The regression of intelligence on criterion or vice versa is distinctly non-linear, for Blakeman's formula gives values of 4.9 and 5.9 respectively. It would thus be hazardous to attempt to include intelligence in a regression equation of higher order. These facts indicate the advantage in as specialized a vocation as agricultural engineering of devising tests for the specific purpose in question.

INTERPRETATION.

If the tests above described are given to an individual for purposes of vocational guidance or selection it is necessary to interpret the scores obtained. This may be done in various ways. The sum of the test scores weighted by the coefficients of the independent variables in the regression equation must of course be computed. This sum may then be taken as the most probable vocational ability of the individual and interpreted, relative to the norms, by considering the standard error of estimate. For instance a normal frequency curve may be drawn with this weighted sum of test scores as the mean and the standard error of estimate as the standard deviation of the curve, or by the use of a table of the probability integral the chances may be expressed of the individual's ability falling within certain assigned limits.

It is perhaps better to develop the interpretation in general terms. It is possible with any correlation coefficient to derive from the table of the probability integral a ten by ten fold table which expresses for any assigned decile in one variable (test) the probable distribution throughout the various deciles of the other variable (vocation). Such a table may be used to predict what per cent of the persons in a given test decile will be in any vocational decile, or to predict for a given individual who scores in a certain test decile his chances of being in any vocational decile. The table below represents such a distribution for a correlation of .60. Some slight adjustments were made to avoid unnecessary decimals. In the columns at the left are given the limits of the deciles of test scores. The first column gives such limits for the weighted sum of the seven tests and the second column for the weighted sum of the two tests in the shorter regression equation.

Test deciles		Vocational deciles									
Seven tests	Two tests	1	2	3	4	5	6	7	8	9	10
.80 to ?	.64 to ?	42	20	13	10	6	4	3	1	1	0
.53 to .79	.42 to .63	20	20	15	13	10	8	6	5	2	1
.33 to .52	.26 to .41	13	15	16	13	12	10	8	7	5	1
.16 to .32	.13 to .25	10	13	13	13	13	11	10	8	6	3
0 to .15	0 to .12	6	10	12	13	13	13	11	10	8	4
0 to −.15	0 to −.12	4	8	10	11	13	13	13	12	10	6
−.16 to −.32	−.13 to −.25	3	6	8	10	11	13	13	13	13	10
−.33 to −.52	−.26 to −.41	1	5	7	8	10	12	13	16	15	13
−.53 to −.79	−.42 to −.63	1	2	5	6	8	10	13	15	20	20
−.80 to −?	−.64 to −?	0	1	1	3	4	6	10	13	20	42

For example suppose an individual scores .65 in the sum of the seven tests. This places him in the second highest decile. Then the chances are 20 out of 100 that he will be in the highest decile in the vocation, 20 out of 100 that he will be in the next highest vocational decile, 15 that he will be in the third decile, 13 that he will be in the fourth, 10 in the fifth, etc. By a decile of vocational ability is meant of course ability like that possessed by the given tenth of the group of students on whom the tests were standardized. A general table like the above is preferable to the scatter plot of the final R of multiple correlation between weighted test scores and criterion because it gives smaller increments.

The above example is typical of the use of the tests for vocational guidance. It makes it possible to tell the student something about his chances of success in this type of work If the tests are to be used, on the other hand, for vocational selection it is necessary to select on the basis of the above distribution table a critical test score and admit to the agricultural engineering course only those who exceed that score. The probable calibre of students admitted or rejected on the basis of such critical score can be determined from the table. If, for example, those with a score algebraically less than−.80 are rejected the expectation is that none of the highest tenth of vocational ability has been rejected but that 42 per cent of those rejected are in the lowest tenth of vocational ability.

Summary

Mental tests were devised for the purpose of predicting ability in agricultural engineering and were standardized upon 43 students specializing in that subject. The tests were given in two installments by means of mimeographed blanks, using the group method. Eighteen test variables were evaluated by means of three instructors' ratings. These ratings were made on a linear scale, reduced to the ratio of x to *sigma* for each instructor and

these converted measures averaged for each subject. The final selection of tests was based on inspection of scatter plots for the 18 test variables against the vocational variable. Eight tests were retained, correlated with the criterion, intercorrelated and the regression equation derived.

The correlation between the criterion and the sum of the eight tests weighted according to this regression equation (one weighting was zero) was about .60. However two tests carried most of the load and when weighted according to a regression equation in three variables their sum correlated with the criterion almost as highly as did the eight. Intelligence, on the other hand, had a correlation of only .16 with the vocational variable, which gave further justification of the effort involved in devising special ability tests.

For interpreting the results of the tests when given for purposes of vocational guidance or selection a ten by ten fold table for the correlation of .60 and its standard error of estimate was derived from the probability integral. Knowing an individual's weighted test score it is possible with such a table to state the probability of his attaining any assigned degree of ability in agricultural engineering.

NOTES AND NEWS

Third Annual Educational Conference Conducted By The College of Education, Ohio State University, On April 5, 6 and 7.

Nearly 3,000 Ohio educators took advantage of the opportunity to attend the Third Annaual Educational Conference which the College of Education, Ohio State University, conducted at Columbus on April 5, 6 and 7. This attendance marked a decided increase over that of 1922 and emphasized, quite graphically, the increasing interest which the school people of Ohio are showing towards these yearly conferences.

Three general meetings, 24 sectional meetings, and several exhibits were lumped into the three-day gathering as the formal aspects of the conference. In addition to this array, however, there were many informal luncheons and dinners of various groups which were so successfully attended and so thoroughly appreciated that they threaten to become a regular feature of the conference.

The keynote of the conference was that of "Objectives in Education" and all of the meetings were guided by this in their discussions. The summary of the meetings which will be published at an early date are expected, therefore, to be a valuable contribution to the literature on educational objectives since the discussions touched on all phases of education as well as on the field as a whole.

One of the interesting sectional meetings was that conducted by Dr. H. H. Goddard on Clinical Psychology. Dr. Goddard presided at the meetings and conducted a Clinic on the examination and diagnosis of children. Children from the Columbus schools were used as subjects. Mabel R. Fernald, director of the vocation bureau, Cincinnati, spoke at this meeting on "The Service a Clinical Psychologist Can Render the Public School Teacher," and the "Value of the School Psychologist in Personal Work With Pupils" was discussed by H. Austin Aikins, Western Reserve University, Cleveland.

Other sectional meetings which were held were: biological science, commercial education, educational and intelligence tests, educational and intelligence tests demonstration, European history, high school principals' association, Latin, mathematics, parent-teacher's association, teacher training, American history, art, city superintendents, county superintendents, elementary principals, elementary teachers, English, home economics, industrial and vocational education, junior high school principals, modern language, non-biological science and physical education.

One of the attractive features of the Conference was the array of speakers of national reputation who spoke at the different meetings. Among these were: W. C. Bagley and S. S. Colvin, Teachers College, Columbia University; C. H. Judd and Algernon Coleman, University of Chicago; L. V. Koos, University of Minnesota; C. A. Works, Cornell University; J. C. Miller, Indiana University; and E. W. Barnhart and F. W. Ballou of Washington, D. C.

One of those chiefly responsible for the Conference has expressed himself as follows: "The remarkable attendance is most encouraging to us in this undertaking to make the Annual Educational Conference a vital factor in the life of the Ohio school system. And the concentration of all the meetings on the problem of selecting clear-cut objectives has meant a clarifying of the aims which the Ohio school people are using as a working basis in the moulding of this system.

"We were especially gratified this year by the participation in our educational program by people whose interest is not primarily educational, such as the business men who aided in the discussion before the commercial education and the industrial and vocational education groups, and too, the meeting conducted for the parent-teachers' association. This gives us a definite point of contact with the people who are supporting the school system and their cooperation makes it easier for us to plan and conduct our work with greater effectiveness."

BOOK REVIEWS

KNIGHT DUNLAP, *The Elements of Scientific Psychology.* St. Louis, C. V. Mosby Co. 1922. 368 pp. Price, $3.50.

In this book Prof. Dunlap has attempted to sift from the great mass of psychological material that essential residue which will be needed by the student of scientific psychology when he comes to deal with the world of "real objects and real activities." While in no sense an attempt at applied psychology it is a very decided attempt to present the facts of psychology in such a way that their application will be possible. The book is intended primarily for college students, but the author assumes that it will also be found useful to the general reader who desires to know the fundamentals of psychology but has no teacher.

The general content of the book may be inferred from the following resume: An introduction dealing with the nature and divisions of psychology; four chapters dealing with sense perception, the senses, and sensory qualities; two chapters on sensory relations and sensory measurements; two chapters on thinking and thought processes; one chapter on the bodily mechanism; two chapters on reactions and reaction types; two chapters on perception; one chapter on affective processes; and one chapter on the empirical self. Two appendices complete the book: the first deals with mental deficiency and mental disease, the second with choice references grouped under certain general divisions.

The following views gleaned from various parts of the text illustrate the author's typical attitudes: Science must be scrupulously exact in the use of its terms, and must furnish experimental proof for all accepted hypotheses. Anecdotal evidence is the bane of pseudo science. The term *sensation* is replaced by the term *sentiendum* as being less confusing. Stimuli are classified as physical, unresolved (without mathematical expression,) and inadequate (unusual.) All sapid substances must be soluble "in water." Classifications of odors based upon the method of exhaustion are futile, a more hopeful method will follow more nearly the chemical method of Ramsay. Color vision is based on a slight modification of the Young-Helmholtz theory, the elementary colors of which are red, blue, and chlor (yellow-green.) The pigmental cells of the retina protect the receptors from too great stimulation in strong illumination. Pitch is the extensity character of tones, and depends upon the degree to which the entire tectorial membrane is excited. Pitch differences at first impreceptible are readily preceptible after sufficient practice. The ampullar and vestibular receptors of the ear have no true sensory function, but give rise only to reflexes in skeletal muscles. Weber's law is responsible for the failure to determine many much needed constants of range and threshold values. The term *conditioned reflexed* as frequently used is a misleading term. The contrast between instinct and habit has been overstressed in the past. Intelligence is a term having many meanings, and as far as it relates to intelligence tests may be defined as "whatever intelligence tests measure." Sound localizations in the median plane of the body are made possible by timbre alone. The semi-circular canals are of doubtful function in equilibration. The eye is blind during the saccadic movements of the eye, as in reading. Meanings do not essentially depend upon muscular movements. Asso-

ciation is only a special case of habit formation, and occurs in exactly the same way as does all serial connections.

Throughout the book the author is vigorous and stimulating; his language is not involved and one cannot avoid catching his viewpoint whether he agrees with it or not. While the author has given credit to all authorities cited he has not done so in a way which would permit the reader to refer to the original sources without considerable difficulty. This omission might be a serious handicap to the general reader who knows little of the psychological literature, in fact the serious student of psychology would feel a little more at ease were the opposing views set aside with more opportunity to investigate the sources of authority. All in all the book is well worth reading because it is so different from the usual presentation, if for no other reason.

Ohio University C. H. GROWDON.

ROBERT MACDOUGALL, PH. D., *The General Problems of Psychology*, The New York University Press, New York City, 1922, pp. 464.

That applied science must be grounded in solid general scientific principles is obvious. Almost as obvious is it too, that general science must be based upon satisfactory methodological principles, although this latter situation is frequently overlooked. Too much by far of our scientific work is conceived and executed with faint or no regard to the indispensable methodological background. In consequence our science is not nearly so free from serious defects as it might be.

In psychology especially must the methodological background be constantly kept in mind, for not only is psychology concerned with phenomena which are the most difficult of any to investigate, but also psychological science is, more than any other, a direct derivative from more elementary ways of thinking.

To the thoroughgoing analysis of the methodological perspective of psychology Professor MacDougall devotes the present volume. Very clearly does he point out how serious and obstructive are the misconceptions which arise when psychologists are not fully oriented with respect to the nature and purpose of the conceptions guiding their work. "The individual may be an acute observer or a patient scholar, but, if the guiding assumptions of his work be mistaken, the force of every gift he possesses further subverts the purpose of research and hinders progress. The work done under such conditions is not merely negative. It is an obstacle set in the way of knowledge, whose seriousness is proportionate to its bulk."

The more positive results derived from a thorough acquaintance with the methodological presuppositions which the psychologist uses, not only make for rapidity and security of scientific advance, but also insure the avoidance of insidious misconceptions. Professor MacDougall in the following quotation enumerates some of these misconceptions which have been made in the past. "The mind's activity is not determined by a sufficient body of inductions to make its speculations rational. Fantastic hypotheses are shaped. Gross perversions of the meaning and scope of science arise. Methaphysical and theological concepts invade its territory. The thinker turns from the patient exploration of fact to spin deductions from a system of a priori definitions. Fact

and myth are interwoven in a new unitary complex. The natural connections of cause and effect are supplemented by essences and forms, magic and miracle, as method shifts unpredictably between theological interpretation and explanation in terms of natural law."

The treatment which Professor MacDougall gives to the general problems of psychology is at once comprehensive and thorough. He discusses not only the relation of psychology to knowledge in general and to the arts of life, but the field, the limits, the methods, data, and specific problems of psychology. It is not necessary to be in full agreement with Professor MacDougall to appreciate that this book is of considerable importance and well worth the perusal of every serious student of psychology.

A. A. ROBACK, *Behaviorism and Psychology*, University Bookstore, Cambridge, 1923, pp. 284.

As its title indicates "this book has had for its purpose the confutation of the claim of behaviorism to the title of psychology." Although the author summarizes his destructive efforts in the following statement, that statement does not convey in full force the severely critical judgment he really entertains of the behaviorists.

"I have tried to show that (1) the concept of behavior is too general to afford us the foundation for a separate science, (2) behaviorism, in its restricted sense, seeks arbitrarily to dominate a field which is not, *ex hypthesi*, under its jurisdiction by bowing out of court everything which does not fit into its narrow frame work, and (4) behaviorism does not readily lend itself to application."

How then is the work of destroying such a "general" and worthless movement as behaviorism carried out? Briefly, by putting all the behaviorists into one group and attacking all through what the author considers the weakest point in each of the very few that he slightly examines.

Similarly, behaviorism is deprived of all applicational value by the simple method of assuming that only mentalism is psychology. In consequence of this fact, it is asserted that if one wishes to handle situations involving intention, belief, intelligence, ideas and emotions, or other such psychological facts, behaviorism cannot be of any service at all.

Indiana University. J. R. KANTOR.

EDWARD ALLSWORTH ROSS, *The Social Trend*. Century Co., New York, 1922, pp. xxii and 235.

War, prohibition, "philanthropy with strings," women in the home and in a man-made world, migration, the vanished frontier, the birth and death rates, a legal dismissal wage: such are some of the topics considered in this collection of papers. It were vain to call it a book.

Written with all the very great attractiveness of Professor Ross' style, fearless, filled with interesting views, the volume deserves a wide reading.

Perhaps none of these papers is more acute than the one on "The Legal Profession from the Social Point of View" or the following one on "The Conscience of the Expert." It is shown that the skill of able lawyers retained by the wealthier, and when

wrong more reckless side, tends to whittle down the defenses of the law. The lawyer is in large measure engaged in an anti-social undertaking. Compare with him the true expert, the product of modern training in scientific method, possessing the scientists love for truth and you have almost a complete antithesis. The one aims to establish a point of view, his side, whether true or false, against the assaults of his brother lawyers; the other to wrest the truth from nature and report it. Society should and will make more use of the scientific expert, not so much because he has a special method or special knowledge, but because he has a conscience sensitive to truth. So be it.

All of these papers deserve inclusion in the collection and their very variety serves to indicate the diversified social trends of a complex social order.

B. F. HAUGHT, *The Interrelation of Some Higher Learning Processes.* Psychological Monographs, Whole No. 139. Princeton, N. J. Psychological Review Co. 1921. pp. vi and 69

This is a study, with very complete statistical discussion, of some so-called higher learning processes, "rational learning," "checker puzzle," "Tait labyrinth" and others, and a comparison of the results of these with the results from the Stanford-Binet. The intercorrelations are low and conflicting and the conclusions are therefore adverse to the Spearman "Two Factor Theory" of intelligence. Are logical conditions and factors in learning on the whole less determinative than such matters as emotional stability or disturbance, perseverance, self-control and so forth?

The Professional Education of Teachers in Cleveland. Cleveland, Ohio. Division of Publications, The Board of Education. 1922. pp. x and 92. Price $ .50

We have here the report of the Educational Commission which was appointed to study the subject named in the title. This Commission was composed of Professors W. C. Bagley, J. W. Withers and Geo. C. Chambers. The pamphlet discusses and makes recommendations on the affiliation between the Cleveland School of Education and the Western Reserve University. It considers admission, organization, curricula, finance and other problems and gives in appendices a number of documents which show requirements and organization of this important joint venture in the pre-service and in-service training of teachers for a great city. The report is an important contribution to current discussion of teacher training.

R. G. JONES, *Survey of Department of Instruction of the Cleveland Public Schools.* Cleveland, Ohio. Division of Publications, Board of Education. 1922. pp. 29. Price $ .50

This is the first of a series of continuous surveys to be conducted by the Department of Research of the Cleveland Schools. It provides a brief analysis of the educational operation of the school system. There are diagrams and tables on enrollment, promotion, age-grade conditions, achievements in individual subjects, the work of the psychological clinics, etc. The material was prepared under the direction of Dr. W. W. Theisen.

ARTHUR I. GATES, *The Psychology of Reading and Spelling, with special reference to disability.* Teachers College, Columbia University Contributions to Education, No. 129. New York,

Teachers College, Columbia University, 1922, pp. viii & 108.

It is sixteen years since Huey published his excellent summary of the psychology and pedagogy of reading. Since that time a great quantity of experimental and clinical work has been done in the field of reading, speech and spelling; and in consequence, it is becoming apparent that the difficulties involved are only now slowly emerging. The solutions are still to be sought.

The present investigation was carried on at the Scarbrough School, Scarborough, New York. Dr. Gates had the good fortune to work with a group of pupils of normal or superior intelligence but who yet manifested the reading or spelling difficulties which form the subject of study. A number of group tests of general mental ability, of achievement in school subjects, of responses to a variety of visual and auditory stimuli and of several sensory mechanisms and motor responses were given to a group of one hundred pupils in grades III to VIII. Detailed individual tests of mental ability, as the Stanford-Binet, and of specialized abilities in pronounciation, word perception, etc., were also given. The investigation was carried out with considerable detail and great care.

In a short review it is impossible to make any adequate report of the study. In the first part of the volume it is shown that there is an ability common to reading, the recognition of correct spelling, proof reading, and the ability to detect differences between pairs of similar words. It would seem that both for prediction and for diagnosis the value of any one of these tests is minimized by the fact that they are applicable only through the use of material which has already been learned; and that the worth of showing that there are psychological elements common to reading and proof reading, for example, is not great.

It appears that the most fruitful portions of the study are the short reports of individual difficulties in reading and spelling. (See pp. 41-42 and 66-67, etc.) It may at least be seriously questioned whether we will ever get very much further with group studies of reading defectives until after we have made more detailed and critical studies of a large number of individual cases and defects.

An interesting conclusion, in view of the work of Huey and his successors, is the statement that inappropriate eye movements are not the cause but only a symptom of poor reading, and even then, not the symptom most easily observed. (p. 57)

Concluding chapters deal with an analysis of abilities involved in spelling and present criticism of various theories of the causes of backwardness in reading and spelling.

Perhaps the most important conclusion of the study—and it is certainly an important one—is that presented in the following sentences: "A case of inability to read affords, frequently, a tangle of difficulties that experts from several professional fields working together may be unable to disentangle. Such a situation portrays clearly the need of a new group of specialists who will make the solution of such problems their main work." (p. 106)

Ohio University H. G. Good.

HENRY E. JACKSON, *Robinson Crusoe, Social Engineer.* E. P. Dutton, New York. 1922. pp. 301. Bibliography of more than 60 titles.

The author divides discussion into three parts. In part I he describes at length the character of Robinson Crusoe. He sees in him a typical Anglo-Saxon actuated by the gospel of work and of courage. Crusoe is represented as meeting numerous discouragements from which he turns unshaken and unafraid.

In part II the author presents certain essential characteristics of the industrial situation as it is found today. The author maintains that the source of the difficulty is found in the fact that the principles of feudalism control industry today. Industry fails to recognize the equality of man a principle which has been recognized for more than a hundred years in politics. He declares that industry in this particular is a century and a half behind politics. Politically men are equal but industrially the old relation of lord and vassal maintains.

In part III the author proposes a solution for the industrial problem. In brief he declares that the solution will be reached when a new attitude of mind has taken possession of those who supply capital and those who supply labor. This new attitude of mind must recognize the principle of manhood—the right of each individual to a proper return upon his investment whether this be in terms of capital or labor. In a word it is a plea for industrial democracy.

The book is full of optimism and faith in the future. The author does not attempt to list successful applications of the new doctrine. He is concerned only with the presentation of a principle of conduct. His discussion is clear and compels consideration on the part of the reader.

FRANK G. PICKELL, *Junior High School Mathematics.* Cleveland, Board of Education. 1922.

This is a course of study and syllabus for mathematics in the Junior High School in Cleveland. In this syllabus material suitable for mathematics in junior high schools has been organized along lines independent of the traditional organization. In the 7th grade graphs, fundamental processes, business forms and accounts, equations, and percentage with its applications, are outlined. In the 8th grade the fundamental processes of arithmetic are further considered and advanced work in the application of percentage as well as intuitive geometry are treated. In the 9th grade emphasis is placed upon algebra. In the treatment of algebra in this grade one important change from the traditional sequence has been made; factoring and simultaneous equations change places. "This change has been made first to stress at the outset the equation as the most valuable tool in the solution of problems and second to prevent the waste of time to the 9B pupils."

KLINE-CAREY. *The Revised Measuring Scale of Free-hand Drawing.* The John Hopkins Press. 1923. Price $ .60. Baltimore, Md.

This is a revision of the authors' earlier scale for measuring free-hand drawing. The revision presents a scale for measuring achievement in the drawing from memory of distinct types of objects. These objects are: house, rabbit, figure in action, and

tree. This has made the merit of furnishing an instrument for measuring achievement along special lines.

Ohio University. W. L. GARD.

WILLIAM T. ROOT, JR. *A Socio-Psychological Study of Fifty-three Supernormal Children.* Psychological Monographs Vol. XXXIX, Psychological Review Company, Princeton, N. J., and Lancaster, Pa.

This study of supernormal children was undertaken because the author felt the importance of the Superior Child to the state and because the lack of information concerning the factors making for superiority give the subject peculiar interest. The aims of the study are mainly to compare the behavior of the superior child with that of the normal child; to note the individual differences of the superior mind in methods of procedure, imagery, associative and mnemonic devices; the qualitive character of their responses; and to try to discover the significance of definite systems of training, by incidental education, and the social milieu.

The children for this research were selected from the city of Los Angeles. The preliminary selection was made thru the schools, newspaper accounts, etc. The final selection was based upon the results of Binet Tests scores and special ability along some line. Several tests were used in the experiment, such as Binet Letter-Square, Trabue Completion Test, Healy-Fernald Construction Puzzle, Proverb Test, etc., and the different phases of mentality studied. Not only the Psychological test given to discover the mental ability of each child were studied, but the social histories were thoroughly investigated. The effects of home life and training upon the mental development of each child were carefully considered.

The author's conclusions are most interesting and valuable to the research student in this field. Mr. Root has reserved no time and energy in stating clearly what he discovered in this work with bright minds.

Ohio University LAVINIA WARNER.

THOMAS VERNER MOORE. *PERCY BYSSHE SHELLEY, An Introduction to the Study of Character.* The Psychological Mononograph, Vol. XXXI, No. 2. Whole No. 14, 1922.

This monograph is an important and stimulating endeavor to apply the literary-historical method of psychoanalysis to Shelley.

In the author's analysis of the mentality of the poet he finds, first of all, the "precox elements of negativism and defense." He is firmly of the opinion that Shelley's plan of life, or its chief driving force consists of an "affective drive for an object of sensuous love" and an intellectual drive colored by protest.

In the development of his thesis the writer seems to insist upon the idea that the prime dominating motive force of Shelly's life was his yearning for a beautiful woman who could unreservedly appreciate him and his poetical capabilities. In support of this view he draws chiefly upon *Alastor.* However, a question of once arises as to whether this poem should receive the interpretation that Mr. Moore appears to give it. Critics have largely agreed that in this significantly autobiographical poem the Poet's quest of the lovely maiden may be any poet's quest of ideal

beauty—such beauty as is celebrated in the *Hymn to Intellectual Beauty*. And although one readily concedes that Emilia Viviani, more or less directly inspired *Epipsychidion*, one much prefers to give the later poem a spiritual rather than a literal signification. Shelley here emphasizes a fact so often expressed by him that a poet must ever seek the elusive beauty of life and poetry and that when he attains to such only disappointment and failure must ensue. The ideality and unrealized end of the pursuit are the agencies impelling a poet. Had the Poet in *Alastor* attained the alluring object of his love he would have experienced defeat in the very fact of his realization; only the continuous striving toward her brings richness or reward.

As a potent influence in Shelley's life Mr. Moore cites the poet's relationship with Harriet Westbrook. He finds little justification for Shelley's conduct. It is to be admitted that even the most enthusiastic admirers of Shelly cannot make an altogether satisfactory brief for him. However, it is gratifying to the lovers of Shelley to note William Sharp's assurance that Shelly's "sorrow and life-long regret for the malfortunate outcome of his action were genuine."

Mr. Moore well points out the element of protest in the poet's character. But one questions whether this factor is wholly, or even largely, due to the "father complex." One is inclined to hold that the Sion House experience, more than any other, enforced, if not implanted, Shelley's hatred of tyranny. Unquestionably there is some difference of opinion as to the poet's home relationships; but all agree as to the extreme distress he suffered at Sion House. Mr. Moore draws upon the Prometheus myth to illustrate his convictions in this instance.

The Prometheus theme, a very popular one in literature, perhaps cannot be summoned to demonstrate anything peculiar to Shelley. True the poet employs it as a medium for his expression of the overthrow of all forms of tyranny and his installation of the Golden Age. Demogorgon, a name which in the drama no longer carries any connotation of magic, is by the poet defined as "Eternity." Shelley has not identified him with mere Necessity because he too strongly personalizes the character; for instance, the closing pronouncement of the last act. The poet's dream reaches its most vivid delineation in the eternal union of Love and Humanity.

Chapter IX of Mr. Moore's article contains a brief analytical summary of the Shelley profile. It is reasonably comprehensive. As has just been indicated one is inclined to differ from the latter test against all authority rooted unconsciously in the hatred of portion of the second predication, namely, "The bold, violent pro-

Books and pamphlets for review should be sent to James P. his father." Perhaps one might suggest that greater emphasis should have been placed on Shelley's generosity of soul. The philosophical-religious aspect of the poet's mind has not been noted. On an earlier page Mr. Moore refers to Shelley's homosexuality. Fortunately this is omitted in the profile. It would be difficult to detect this element in Shelley's mental constitution.

Mr. Moore's careful and scholarly work is, in most respects, to be warmly commended. He has given us an effective attempt to

ascertain the mental traits that most palpably have revealed themselves in the operations of Shelley's mind.

Ohio University HIRAM R. WILSON.

The Honesty Book. Prepared and published by The National Honesty Bureau, 115 Broadway, New York.

A textbook for schools written by business men instead of by pedagogues, a good idea. Hitherto the most recent illustration in schoolbooks of business honor have been taken from such remote examples as Benjamin Franklin and Peter Cooper. This little book begins with a talk about a modern office-boy, tells how a young man today gets a bond and it is replete with references to the business practices of our own time. The National Surety Company has originated the plan of reviving the commandment. "Thou shalt not steal," in the schools and has had the stories and methods tried out successfully in real schools by teachers with actual pupils. The stories are crisp, pointed, unconventional and avoid the goody-goody.

The volume is an interesting attempt to demonstrate how a particular virtue may be inculcated. Its suggestions give promise of being helpful to teachers in teaching other virtues. The book and the campaign of which it is the instrument are to be heartily commended.

Ohio University JAMES P. PORTER.

NEW BOOKS AND PAMPHLETS RECEIVED*

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BACH, TERESA. *Education in Poland.* Bulletin No. 41, 1922, Bureau of Education, Department of the Interior, Washington, D. C. 21 pp.

BARNES, EARL. *How the Kindergarten Makes Americans.* Kindergarten Circular No. 9, Bureau of Education, Department of the Interior, Washington, D. C. 6pp.

BARROWS, ALICE. *First National Conference on the Work-Study-Play or Platoon Plan.* Bulletin No. 35, 1922, Bureau of Education, Department of the Interior. Washington, D. C. 16pp.

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* Mention here does not preclude further comment.

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DEARBORN, WALTER F., *Edward A. Lincoln* and *Edwin A Shaw. Standard Education Tests in the Elementary Training Schools of Missouri.* Harvard Monographs in Education, Whole No. 3, Series 1, No. 3. The Graduate School of Education, Harvard University, Cambridge, Mass. 90 pp.

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